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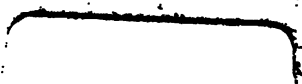
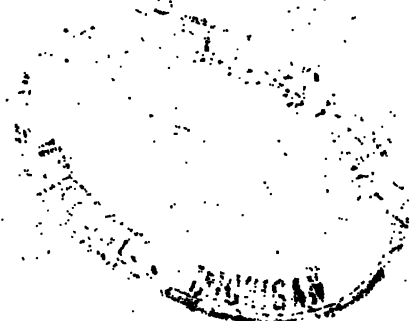
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THE HANDLING OF

RAILWAY SUPPLIES:

THEIR PURCHASE AND
DISPOSITION.

—BY—

67112
MARSHALL M. KIRKMAN.



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1887.

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Marshall M. Kirkman,

Chicago, Ill.

PREFACE.

The intelligence and fidelity exercised in the purchase, care and use of railway supplies, influences directly the cost of construction and operating, and affect, therefore, the reputations of officers and the profits of owners. Accounting officers are also interested in the subject, as it is connected with the details of their office. To many (perhaps the bulk of railway officers) the handling of railway supplies is an unknown quantity. The subject needs elucidation on many accounts.

The supplies of a company are understood to comprise the material in store not yet charged to any operating or construction account. In attempting to suggest safeguards for the faithful and economical use of material, I am led into a discussion of the best means of preserving it after it passes into the hands of employes, as its loss or wasteful use in such cases directly affects the original supply. This enlarges the subject greatly, and enhances its importance.

M. M. KIRKMAN.

CHICAGO, ILL., April 30th, 1887.



THE PURPOSE OF MY BOOKS.

The question is asked me daily, how I, a busy man working for another, find time to write books in addition to my regular work. The question is pertinent, and I wish to answer it here. All my writings up to this time have referred to my business, and have had for their purpose the advancement of the interests of my employer. If he has derived no benefit therefrom, then I have simply fallen into the mistake, made by so many men occupying positions of trust, of over-estimating my services in his behalf. And in reference to the immediate scope of my writings, they are intended, it is proper to say, wholly for the young and advancing class among railroad men; for those who lack opportunities of learning; for those who desire to know the subtleties of railroad affairs, yet are prevented by their restricted position. The interests of railway companies require the widest diffusion of knowledge among this class, but, unfortunately, there are no present opportunities by which it may be acquired, except as they pick it up piecemeal, here and there. These books are intended, so far as their limited scope applies, to supply this deficiency. The Managers of railways have no wants in this direction, and I have never been able to write anything that I thought especially meriting their regard; their great talent and opportunity make their knowledge cosmopolitan; make them teachers; the natural exponents of railway policy and practice. I have noticed, however, that the general knowledge of railway affairs possessed by them had a tendency to make its exposition appear unnecessary, a work of super-erogation. This is the natural error that men fall into whose appetite is losing its elasticity through over-use, the mistake of successful men, of men whose ambition is gratified. They forget that the stale platitudes of to-day were to them the hidden mysteries of yesterday; that what is common-place to them, is the source of the liveliest curiosity to their less favored brethren.

M. M. K.

METHOD OF GIVING INSTRUCTIONS.

There is nowhere in the world an equal body of men possessing higher integrity and intelligence than the men who operate our railroads. They are, practically, a unit in their efforts to serve their employers faithfully. They comprise an army, and in order to be handled effectively must work under explicit orders.

Now, there are two ways of giving an order. One says "You Must." This will do, if we are on hand to see that it is observed, and possess the requisite authority; otherwise, such an order is like firing into the sea. A few conscientious men will observe an order of this kind from principle. The mass, however, do not regard it, except so far as punishment attends neglect. The reason is, not that they are wilfully disobedient, but that they are busied with other matters and, not understanding its necessity, neglect it. No one, if left to himself, will carry out an order of which he does not understand the force.

The other way to give an order is to accompany it with an explanation of its purpose and necessity. By this method the person addressed becomes a party to the transaction. The order not only appeals to his sense of authority, but to his judgment and fidelity. There are, therefore, three reasons for expecting its observance, in such event, while there is only one in the other case.

In many instances explanation is unnecessary and improper. The person addressed understands this quite as well as any one. But a great system like a railway that is dependent upon co-operative effort cannot be carried on unless there is concurrent knowledge among those who do the work. It is not only necessary to tell them that they must do a particular thing, but it is necessary to tell them the reason. This is the plan I have observed in my books.

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THE HANDLING OF RAILWAY SUPPLIES.

CHAPTER I.

PROPERTY.

Envy is the peculiar and predominating curse of our day and if the Commandments were to be re-written at this time, the sin of covetousness would probably be the first-named, instead of the last. Nothing in the history of the Jews reflects more credit upon them than the fact that this sin was esteemed the least of their vices. Its enormous importance at the present time grows out of a false conception of the relations that men were intended to occupy towards each other by the Creator. It grows out of a mistaken belief that through "cramming" and other processes, the dull and worthless may be made the equals of those upon whom God has stamped the highest attributes. Out of the truism, that all men are equal before the law, has grown a belief that they are equal in everything. Hence the jealousy and rage of the improvident, the incapable and the worthless, towards those who through their wisdom or self-denial are able, while supporting themselves, to add to the capital of the world.

The desire to be rich is laudable, but to desire a thing because our neighbor has it, is base. The secret of man's happiness is contentment, coupled with an honest

desire to add to his position and comfort. Out of these simple characteristics the greatness of the world has been achieved. Envy and jealousy have never advanced mankind in the direction of either greatness or goodness, directly the reverse, and it is the curse of radical teachings that their effect is to make men envious without adding to their intelligence or the nobility of their purpose. It is fashionable to ascribe the rapid advance of the world to the teachings of radicalism. It may be more justly ascribed to the power of the telegraph and railway locomotive; to the abundant and rapid communication that they render possible between not only the people of particular countries, but of the whole world.

Economists tell us that the capital of a country represents its accumulated savings. Certainly it is an evidence of the intelligence and thrift of a people, of their disposition to work and the respect they pay to the rights of others. It evinces, especially, their ability to sacrifice present gratification to future good. Every dollar of capital represents a luxury denied. This is true, no matter what the wealth of its owner. The desires of a millionaire and the pressure put upon him to dispossess him of that which he has, exceeds the pressure put upon the poor man, in the proportion that his means exceed those of the latter. A pleasure does not consist in the thing itself, so much as in the effort it cost us; in the deprivation that it represents; in its rarity, in fact. The banquet that costs a million of dollars is not enjoyed more heartily by host or guest, or partaken of with feelings of greater self-esteem, than that experienced by

the colored man in the swamps of South Carolina who invites his neighbors to partake with him of sweet potatoes and opossum. Nor is the discontent among those the rich man omits to invite greater than among those whom the South Carolinian fails to ask to his simple feast. If, however, we make the latter believe, either through political teachings or otherwise, that he also ought to be able to give a million dollar banquet, without the expenditure of corresponding intelligence, labor and self-sacrifice, then we shall destroy his happiness and his value as a citizen, without advancing the interests of mankind in the slightest. This is exactly what many of the political maxims of the present day are doing.

It is a compensating advantage afforded by a general and wise law of nature, that the poor man shall enjoy the luxuries his scant means afford with the same *zest* that the rich man derives from the expenditure of *his* wealth. When, therefore, the former is blessed with work and a contented disposition, (and a contented disposition is the *natural* inheritance of every man) it follows that he must be as happy as his neighbor. If, in addition to this, his habits are frugal, he, too, will acquire riches. He will commence by acquiring a competence. This will be his first aim. It is but a step thence to wealth.

If it be true that enjoyment is a relative term, it must also be true that jealousy of those apparently more fortunate than ourselves is the result of misapprehension. Not only is this so, but it is, moreover, the evidence of a mean spirit, of a narrow comprehension, an inelastic

spirit, a sordid intellect; an evidence of moral obliquity, of a mind unable to enjoy that which it has or derive happiness from anything it may attain.

Envy is the curse of modern social life; it disturbs the slumbers of the poor man without bettering him and is a thorn in the side of the rich.

The desires of the envious are never spontaneous, not natural, but grow out of the acts of others. They esteem not the comforts they possess, but glance with lowering eye at the apparently greater comforts of their neighbors. Happiness to such is an unattainable felicity. Whatever success may attend their efforts, the fruits that should accompany it will ever elude their grasp. Their minds, instead of being soothed by that which God has given them, or which they may hope to acquire through their talent, or industry, or self-denial, are only disturbed.

Envy is the outgrowth of forgetfulness, of ignorance, of selfish indifference, of studiously ignoring the fact that the thing it covets represents a sacrifice equal to its extent upon the part of particular men, women and children; represents, moreover, the protection that has been accorded its owner by the state; represents a principle, a disregard of which will destroy civilization, make might the sole arbiter, and destitution and wretchedness the common heritage of all. There are, of course, instances where wealth has been acquired quickly, through fortuitous circumstances, without special deprivation. These are, however, exceptional cases and do not affect general principles or conditions.

The great bulk of the capital of the country—all but an infinitesimal portion of it, in fact—represents, to its owners, years of intense thought, of hard labor, and self-denial.

The material interests of a country afford evidence of its strength of purpose, the grasp of its people. The acquisition and maintenance of property, occupy alike the thoughts and purposes of christian and pagan; of those already rich; of those who hope to become so; of those who possess a competence; of those who are struggling to acquire one. Man's struggle to better himself broadens his comprehension and multiplies his ability to help others. The inestimable boon that wealth conveys to the community, is the opportunity it affords its possessor to give employment to others. No one who possesses within himself the true elements of manhood, seeks or desires other aid from his fellows than opportunity to work. This boon granted him, he becomes the arbiter of his own fortunes. His progress may be slow, but this will not render it less attractive. The determination of a man to succeed, heightens immeasurably his intelligence, and increases correspondingly his value as a worker. His savings, meagre at first, constitute the nucleus of a fortune. Once the start has been made, the future is assured. The value of saving is but poorly represented by the amount of money laid by. It is more fitly represented in the strengthening of the character of the person; in giving him a purpose in life, a fixed goal to be reached; in making him self-contained; in occupying his mind with ennobling thoughts,

with lofty aspirations. Thus engaged, he has little time, and less inclination, to meddle in the affairs of others, to criticise their failures, or to growl over their successes. The man who has acquired the habit of saving, sees before him an old age secure from want, his life closing amidst contentment and happiness. He has no incentive to steal. He is not envious of those who have more than he has, because he hopes to become their equal. The habit of saving represents industry, contentment, integrity, loyalty, exalted purpose, an honorable life, a green old age.

The avenues through which wealth may be acquired multiply with the thought given to them. Herein lies the secret of rich men. Their capacities are no greater at the start than others, but their purposes are higher, or if not higher, more steadfastly pursued. Their determination is greater and the necessity of sacrificing the present to the future more apparent. Riches are the fruit of intelligent purpose, of indomitable perseverance, of prolonged self-sacrifice, just as prolonged poverty is the fruit of present gratification, and wasted opportunities.

Encouragement to save and the preservation of that which has been saved, is one of the chief duties of government, one of its greatest and most beneficent functions. Upon the care and wisdom thus exercised depend not only the present happiness and prosperity of a people, but their future. Such protection encourages those who have to increase their sphere of usefulness, and is an incentive to those who have nothing, to acquire,

first, a competence, afterwards, fortune. A government can have no loftier purpose than this. Every other benefit follows in its train or is collateral to it. It represents food, clothing, independence, enlightenment, manliness, contentment, and respect for the rights of others. The tendency of modern teachings is to make these things secondary to mere forms, words; to the belief that theory is superior to practice; that the history of the world and its governments does not represent the wisdom of mankind, but its perverted purposes.

No country whose citizens do not aspire to fortune and which does not possess avenues whereby this aspiration may be successfully pursued, can hope to be permanently prosperous. But it cannot be too often repeated that the first step in the progress towards wealth is by hoarding; by saving something, however small, from the yearly earnings. The insignificance of these sums frequently makes them appear absurd, the outgrowth of a base and mechanical spirit rather than otherwise. This is an immature view of the subject, a view taken through a restricted lens. The act of saving is at once the evidence and demonstration of the highest and best qualities of mankind. It is an evidence of self abnegation, and the assurance and precursor of ability to help others; to afford them the same facilities in the struggle of life that we have enjoyed. When once the determination has been made to save, the processes of thought it invokes makes men contented with themselves and their fortunes; they no longer look to vague and fortuitous circumstances for that which they desire; their purposes and

methods are definite and settled; they no longer look upon the possessions of their brother with the eye of a robber, but view that which he has with kindling interest while availing themselves to the utmost of his experience and assistance.

Whatever a man thinks, he becomes. The thoughts of an industrious and saving man foreshadow a period when he will no longer be compelled to work. His dream of idleness, of course, is purely Utopian, because work is necessary and its discontinuance foreshadows decay and death. Nevertheless, the prospect of a competence, the hope of a fortune, the dream of independence, stimulate him to labor and to save. When the mind has once been directed to the acquisition of property, it grows with what it feeds upon, multiplying the usefulness of the man according to his talent and opportunities. The process of acquisition once set in motion, never ceases. On the other hand, the desire to possess without the disposition to labor and to save, is the instinct of a robber, of a common thief. That a person so constituted, will, sooner or later, attempt to ply his vocation, follows as inevitably as honor and wealth follow in the case of his more unselfish brother.

The mistake that men make in believing that wealth will bring contentment and happiness without prolonged self-sacrifice, lies in ignorance of the fact, that to be fully enjoyed it must be honorably earned. As well might a soldier hope to enjoy as victor the battle won by his comrade, as the possessor of wealth hope fully to enjoy that which had been earned by another. The his-

tory of every self-made man illustrates this, and while the predominating thought of self that his success engenders may detract somewhat from his merit as a social companion, it truly evinces the absorbing delight that the accomplishment of an object long pursued affords. It is the delight of such a person to talk of his achievements, to recount his adventures, his successful schemes, the labor they involved, the empires of industry that they gave birth to. The gratification he feels in exhibiting his wealth, his horses, pictures, houses, even his raiment, is the gratification of a child, the gratification that follows an effort long sustained and ultimately successful. We participate with such a man in his laudable pride and are refreshed by its innocence and ardor, and while we may not hope to be equally successful, we cannot fail to observe that his happiness is the outgrowth of previous deprivations.

These thoughts are hardly germane to the subject I propose to write about, namely, the property of railroads, but they are suggested by it. The property of railroads, however great its magnitude and however impersonal its ownership appears to be, represents the accumulated savings of particular persons, just as the coal that is laid away by the widow for her winter's use represents her savings. And except for the saving disposition of mankind that is evinced in railway property, there would never have been any money with which to build railroads in the first place, or extend them after their success had been demonstrated. Every mile constructed, every new car built, represents money that has

been hoarded by some one. It is a material, physical evidence that some person or persons, instead of spending everything to gratify purely selfish purposes, have laid aside a portion and this portion, is invested in railroads; to the extent they have done this, the community is better off, enjoys better facilities, greater comforts, so much greater opportunities for making money. The employes of railroads are, moreover, bettered by it, as their sphere of usefulness is thereby increased and their number multiplied. It ought not to be necessary to say that there is no shadow of difference between the rights of those who own railway property and the rights of others. But the unjust accusations that have been made seem to render it necessary to call attention to the fact that railroad property is, equally with other property, entitled to protection, entitled to earn a return for its owner, and to deprive it of either, or to threaten to do so or suggest its desirability, is to encourage a spirit that will ultimately overwhelm all kinds of property in common ruin.

CHAPTER II.

RAILWAY SUPPLIES—STORE-KEEPERS.

In order to bring the subject I propose to discuss within the space I can devote to it, I shall restrict myself to a particular kind of railway property, namely, the supplies that are necessary in the operation of these enterprises.

This indirectly includes property of a portable nature, such as tools in the hands of workmen, the due protection and careful handling of which immediately affect the material which must be used to replace it. I shall, therefore, not only consider the question of supplies, but suggest such safeguards in connection with them after they have been distributed for use, as occur to me.

The supplies of a company, (i. e. the material in store,) constitute personal property; they are in the nature of a permanent investment. They have a current value in the market, yet are not available as an asset (except in the sense that the right of way of a railroad is an asset), for the reason that a property cannot be operated without them any more than it can be operated without a track. They are, therefore, to be viewed from the same standpoint as the latter. They cannot be disposed of and can only be slightly diminished in amount. The custom in regard to the disposition of this description of property is not uniform. It is not the practice in America, as a rule, to capitalize these investments. The reason of this omission is that the amount is fluctuating, and in the early history of every enterprise the sum is small and its future dimensions so difficult to be calculated that its importance is generally overlooked.

The amount of material that it is necessary for a company to keep on hand to meet current wants depends largely upon the character and extent of its property and business.

It is probable that the value of these supplies, with the tools and light implements in the hands of employes,

represents a sum of not less than two hundred and fifty millions of dollars.

What disposition is made of this property? What safeguards are thrown around it to prevent its deterioration, misappropriation, or wasteful use? These questions I cannot hope to answer, except partially. The subject is too large to be compassed within a single interview. Its full elucidation must represent the wisdom and experience of many men, and will be, therefore, a work of time. Nevertheless, I shall describe, so far as my knowledge and limited time will permit, some of the things it is desirable should be more generally observed, leaving it to others more competent to supply my omissions and correct my mistakes.

The supplies of a company represent cash. It costs cash to replace them. They should, therefore, be guarded with equal intelligence. This is not usual; the reason is that the use rather than the value of the thing is considered. If a company loses a package of money, the fact is bemoaned by a whole continent; the associated press recognizes its importance; the telegraph resounds with its details; local reporters exert themselves to ascertain particulars; the delinquent is publicly reprimanded, very likely disgraced. If the money is stolen, myriads of detectives prick up their ears in anticipation of the reward. If the agent of a railroad is discovered to have embezzled a few dollars, the whole official staff trembles with suppressed indignation and no stone is left unturned to secure a return of the money and the dismissal of the delinquent. This is not the rule in regard to material. It

is probable that such losses in the majority of cases, are not known at all, even by those immediately in charge. If the loss occurs through the improvidence or neglect of the store-keeper or person in charge, certainly it is never known by any one but himself. Why? Because of the methods of handling material.

The amount of material at any designated point is to a certain extent, an unknown quantity. The methods of storing and disbursing are so imperfect that absolute precision, as in the case of cash, is impossible. Hence, if there is a surplus or deficiency when the inventory is taken, it is adjusted in the accounts without remark, unless excessive or peculiar. The rule, therefore, that governs in the case of cash does not apply with regard to material. It is probable that those in charge of material are quite as honest as those who handle cash, but the property intrusted to their care is subject to certain extraneous influences that cash is happily free from. This fosters improvidence, carelessness of thought and action in connection with it, and while any known offence is punished, discovery is not absolutely sure, as it is in the case of loss or misappropriation of money. This is demoralizing. It makes men forget or ignore the fact that property of this nature has the same value to a company as cash and that its destruction or improper use is equally disastrous.

In order to secure necessary and proper safeguards in the handling of material, we must consider it from the standpoint of value solely. To misappropriate or waste it must be esteemed the same as the misappropriation or

loss of money. Its deterioration through lack of proper care must be looked upon the same as any other offence against good business usage. Its loss must be thought the same as the loss of money. It is no exaggeration to say that a cashier who would use a drawer that contained cracks through which more or less of his money was lost, or that was too small to accommodate the supply, or who stored his surplus cash on window sills and in public entries, would be considered improvident in his methods of business. The losses that transpire in connection with the material of a company that are avoidable, within just and reasonable limits, are as inexcusable as the loss of money would be under the circumstances named. The disparity that exists between the care of property and the care of money is almost ludicrous, not only upon railroads but everywhere else. Our money we watch with unceasing vigilance; when we receive it we count and recount it, examining it meanwhile with eye and tooth. While it is in our possession we store it in costly vaults and in safes at once the pride of the safe man and the despair of burglars. When we pay it out we count and recount it as before, and at the close of each day particularize our payments and sum up that which we have on hand with the utmost precision, lest a penny should have escaped, or a surplus penny, somehow or other, have crept into our possession. This care is not exaggerated. It is the result of experience, of necessary precaution. What are the practices in regard to material? Is the same provision made for it that the merchant and manufacturer practice? Hardly! We endeavor to inspect it

when it is received, but in consequence of the lack of proper facilities for handling many counterfeits are palmed off upon us. When received, we do not place it in costly vaults or safes, nor even behind oaken doors or carefully barred windows. The smaller articles we place in what we call a store-room. This store-room is, however, in many cases, nothing more or less than a few shelves loosely constructed in a round-house, or a partition thrown across a corner thereof, without adequate locks or bolts. If the supply of material is large, a special room is assigned. But this room, in the majority of cases, is much too small, and its internal arrangements illy adapted to its purpose. Whatever its character, we use it only to store small supplies. The great bulk of the material lies scattered about the various buildings and yards. Some of it is waiting to be used on the morrow, some of it has been "stranded," so to speak. It is more or less scattered, because there is no convenient place provided for it. All of it is suffering more or less deterioration. Some of it is partially destroyed. Some of it wholly ruined, while the more volatile oils impregnate the earth with their moist drippings and perfume the air with their offensive odors. The picture is not exaggerated. There are, of course, exceptions. I have in mind store-houses constructed recently in the light of our experience and known wants that are in every way adequate. These are the exceptions, however.

The blame does not attach to the railroad managers of to-day. It long antedates our time. Innumerable reasons tend to perpetuate it. The scant thought de-

voted to the subject originally by those who planned our shops and depots of supply strikes the observer with amazement. If, when we paid money into a bank, it were necessary for the teller to crawl over a contiguous counter, through an open window, past a long line of men engaged in various occupations, in order to reach his money drawer, located in the coal cellar, we should say that the bank was poorly planned, if economy in its working and safety in the care of its funds were desirable. Yet the practices in regard to the handling and storage of material in many instances is not any more surprising than the case cited. And what is more remarkable still, is that it excites neither surprise nor suggests correction. It is probable, that the illy conceived, and more meanly executed, system of railroads for handling material, grew primarily, out of the division of responsibility in regard to the matter. The system sprung up, like "Topsy," without method or forethought. If our shops were planned by an engineer, it is probable he was not called upon to make any provision whatever for supplies, or, if he was, the warehouse was inconveniently located. The rule has been to construct the storehouses out of remnants, not with reference to convenience of unloading, storing and disbursing, but rather with regard to an unoccupied spot, a place apart, something "remote, unfriended, melancholy, slow!" While the most elaborate provision has been made for equipment and machinery, the store-room for supplies has been forgotten or ignored. Nothing could exceed the commodious and convenient character of our machine shops and round-

houses or the minute care that has been exercised to see that all the parts harmonize exactly with the use that is to be made of them. Every device by which economy of labor and the protection of the plant could be secured has been carefully considered. These are only necessary and proper precautions. The same standard of excellence should have been observed in regard to the supply stores. The standard should be the standard of private practice.

It does not require any extended or technical knowledge of railway affairs, to teach us that the same care should be observed to protect railway supplies that a provident merchant uses to protect similar merchandise. To the extent that this is neglected, we are remiss.* The occasion of this remissness may excuse it, but it does not alter the conditions; to say that it is the result of lack of forethought and not of design, of inexperience and not of deliberate improvidence, does not make the loss any less. We ought not to expect, however, the same high standard that the merchant exhibits. His intelligence is heightened by the instinct of ownership, an hereditary instinct; the instinct that one merchant hands down to another. These who operate railroads have not the habits of merchants, nor their personal incentive. This does not imply that they knowingly, or

*The truthfulness of this picture will, I think, be recognized. It is general. Indeed, I may say in this connection, that nothing in this book, or indeed in any book or pamphlet I have ever written, has other than a general application; is intended to meet other than general conditions; wherever these conditions are recognized, therefore, they may be accepted as common, though not necessarily universal; they are never in any sense personal or peculiar and are not intended to have any application to particular properties, places, times, or men.

willfully, omit any precaution or violate any law of ethics. The standard of morality among them is, probably, quite as high as it is among merchants. It is less effective in its methods, that is all.

In individual cases great progress has been made in the manner of handling material; particular companies have given the matter elaborate thought and fit expression. These are the exceptions. Moreover, proper provision is, in many cases, impossible at the present time. The room is lacking or the arrangement of shop buildings prevents it. Originally, the considerable cost that a store-house involved, rendered it expedient to get along without it, and seemed to excuse the neglect to make provision for one afterward. This is a reason why we are without store-houses to-day where we should have them, or why they are located with so little intelligence or so little adaptability to their use. That such economy was not justified, no matter what the circumstances of the case might have been, no one familiar with the subject need be told, but unfortunately criticism avails nothing. In the inception of our present great companies the poverty that enveloped them knew neither time nor utility, and it sacrificed, in its improvidence, both present and future. That the saving on the outlay would have abundantly justified the apparent extravagance, we now know. But no criticism can remedy the inherent evils that follow the original neglect. They are irreparable. Intelligent study of the subject may, however, it is hoped, ameliorate the conditions, even at this late day, and it is

the belief that this is so that suggests reference to the subject here.

Not the least of the losses that a company suffers through improper methods of storing its material, is the demoralization that it engenders; the suggestion it affords the unstable to appropriate that which they see so lightly esteemed; of the improvident use of material that is seemingly of so little value; of the disposition it inculcates to multiply losses by ever-increasing neglect; of the imperfect knowledge of the supply on hand that it engenders; of the excessive orders that must grow out of this ignorance; of the impossibility of enforcing responsibility in the disbursement of material; of the lack of care in sorting and disposing of old material; and finally, and generally, of the loss of personal responsibility it engenders.

No company can be so poor as to justify neglect to make proper provision for handling its supplies, to protect them from the elements, to throw around them such safeguards as are necessary to prevent their loss or improvident use. For those articles that have a current value, such as copper, brasses, and tools, secure storehouses must be provided, with every needed facility. For oils and kindred substances, capacious tanks should be provided, in which they may be securely stored, and from whence they may be drawn without waste or unnecessary labor, as needed. For bulky articles that cannot be carried away surreptitiously, simple sheds are all that is needed. For old material and scrap, room is needed, first, for assorting, and afterwards for protection and security.

Provision for storing should, in fact, be such as an owner would provide under like conditions. The value is the same, the risk that attends neglect the same, the cost of replacement the same. This is not only true in regard to the supplies about the general shops and round-houses, but it is also true in regard to the material that is scattered along the line, whether new or old. Every section should not only have a place in which to store its tools, but it should have a secure place in which to store supplies and worn-out material. It is necessary to save them from loss and depreciation, but it is also needed to enable the foreman in charge to render an intelligent account of the same.

THE STORE-KEEPER.

To handle material properly, requires that, according to its store-houses, a company should have a corps of store-keepers, skilled in the knowledge of railway supplies and faithful in the care and disbursement thereof; men who in inspecting them are able to determine rightly their character, and who may be trusted to make a true report thereof; men who will guard the property while in their possession and see that it is disbursed only for good and sufficient reasons; who will, so far as possible, look after its disposition after it has passed out of their immediate possession; men of sufficient judgment and experience to anticipate the wants of the service and, in the case of the more rude supplies, to direct their delivery at the point most convenient for their use. These men must not only be trustworthy, but they must be minia-

re merchants, so to speak, with the provident instincts of merchants, for while holding a subordinate office, they are important factors in the working of a property. They must also be thorough accountants, familiar with the various returns and methods of disposing of railway supplies and labor. In reference to these accounts, I have not space nor time to consider them here. The subject has already received very exhaustive consideration. The method of accounting, however, I may say generally, should be sufficiently copious to enable the various operating officers through whose hands the accounts pass, to scrutinize the articles of material that have been added to the previous supply and to know from whom received; also the material disbursed and the object upon which expended. Moreover, no material should be charged to an account until used, or in other words, all material should remain in store and appear as an asset in the company's books until actually given out to the workmen for immediate use.

Store-keepers must be men of such character and judgment that they can be trusted to look after the interests of their employer without continual spur or special commendation. They must be honest, intelligent, experienced, vigilant. They must, moreover, have such pliability of manner and disposition as to be able to live in peaceable accord with officials of the company about them, but over whom they have no control and from whom, in many cases, they will receive little or no aid. This involves both intelligence and amiability. A company requires such a man at every depot where material

is stored. To him the subordinate and attendant details, including the necessary force, should be left. To him the immediate responsibility for the receipt, care, and disbursement of material should be entrusted. Due efficiency requires that his clerical force and attendant laborers should be responsible directly to him, and that any authority exercised over them by others should be through him. It is not necessary that a store-keeper should be entrusted with discretionary power to order material. He should, as a rule, act in such matters under the instructions of the operating officer immediately in charge, unless it be in the case of a general store-house from which a system is supplied. In that event, it should be the duty of the person in charge thereof to make requisitions.

CHAPTER III.

THE PURCHASE OF SUPPLIES.

Men filling places of trust fall readily into the belief that general knowledge of their duties lessens their importance or loosens their hold. This is, perhaps, true, of a mechanical office, or if its occupant is unfit; otherwise not. It may be set down as an axiom, I think, that the more generally the *methods* of railroads are understood, the more efficiently they will be managed and the more profitable they will be to their owners. There is nothing about their system of operations that calls for

secrecy, and the wider the diffusion of knowledge respecting it, the more thoroughly the community will appreciate the magnitude of their affairs and the necessity for their being carried on by their owners according to approved methods of business. The importance of individuals may in isolated instances be lessened by publicity, but properties will be benefited. These thoughts are, perhaps, not pertinent to the subject immediately in hand, but occur in connection with the railroad problem and find fit expression in any exposition of it.

Turning to the subject of supplies, and more particularly their procurement, it is manifest that many of the details thereof cannot be described. They embrace the varied peculiarities and artifices of tradesmen, the fluctuations of markets, and the peculiar conditions that attend the production, transmission, and use, of each article. The list of goods that a railway company buys, practically embraces every known article used in the economy of life. It is apparent, therefore, that the details of the subject cannot be compassed within a chapter or treatise, and that any description must be so general as to lose greatly in value.

The purchase of goods embodies many varied talents and experiences. The ability to buy advantageously, depends largely upon the knowledge of men possessed by the purchaser and his skill in taking advantage of this knowledge. His value will, moreover, be dependent upon the discretion allowed him, and his judgment in exercising it. The position also requires technical skill. The person filling it must be experienced, otherwise his

acts will not command the confidence or respect of his associates. His wisdom and fairness must be such that if he selects material contrary to the requisition made upon him, the person thus over-ruled will tacitly acquiesce therein and abide by the demonstration of his wisdom afterwards. Unless the operating officer has this respect for the purchaser, he will quite likely not use the article thus bought, or, if he does, will not give its advantages fair expression. The office of the purchasing agent requires minute knowledge of the physical affairs of the railroad employing him and the tact and patience necessary to give this knowledge expression.

The assistance that an experienced purchasing agent can extend to his associates is hardly to be estimated. His duties not only familiarize him with all new devices, but his observation enables him to point out those most likely to lessen expenses or add to the efficiency of a property. The office cannot be made automatic. It must be vitalized by the presence of an experienced, able, and strong man, possessing withal the amiability and tact in dealing with men that is requisite to give such a position effective force. Ability to sell at the best figure is a natural art possessed only by merchants, and in order to purchase cheaply, this art must meet its counterpart in the instinct to buy cheaply. The more nearly, therefore, the purchasing agent resembles the merchant, the more valuable he is likely to be to his employer. It will not only enable him to trade advantageously, but his selection will be characterized by good judgment and his methods of business will be systematic, adaptable and

thorough. Only such a man can escape the wiles of those who traffic in the wares of railroads.

The opportunities of a purchasing agent, no matter how great, while not making his judgment equal to that of the person who uses the material (provided the latter is informed as to the various devices from which selection may be made), is nevertheless of great value to a company as supplementing the knowledge of the latter and as a reminder to him that his requisitions must pass under the careful scrutiny of an alert co-laborer. The more prolonged the experience of a purchasing agent, the wider his observation and the greater his value to his employer; each day adds something to his knowledge of goods and their adaptability to his wants. The craft of salesmen is proverbial, and the most alert buyer frequently finds himself at a disadvantage. The greater the experience of the purchaser, therefore, the more probable that he will not be over-reached.

The great benefits that accrue to a railroad from a good purchasing agent are not so generally esteemed as they should be. Judging from the changes that occur, continuance in office is not thought to be a matter of especial importance. This cannot, of course, be the judgment of experienced railway managers. They know better. It must, consequently, be the expression of those high in the government of these properties who are yet lacking in a just appreciation of their wants. By these the place is too often looked upon as one that any man with ordinary intelligence can fill acceptably; a position at once agreeable and measurably lucrative, but

not of great importance. No greater mistake could be made. Directly the reverse is the case. To be able to buy its supplies at the lowest possible figure is of enormous value to a company, and a capable purchasing agent, it is probable, can save his employer a greater sum through the exercise of experience and intelligence, than any other officer of like grade.

A shrewd purchasing agent will constantly supplement his knowledge of affairs by intercourse with those who have practical knowledge of the use of the wares he buys. He will be, moreover, constant in testing what he buys; in subjecting it to the most careful comparisons; in discovering in every intelligent and practical way its utility, durability and relative value. These experiments will not be matters of accidental or infrequent occurrence, but will be carried on systematically from day to day, the same processes being observed over and over again with the same classes of material. This will be especially the case in regard to oils, varnishes, iron, wheels, axles and kindred articles, the quality of which is so important. Upon many lines the value of these tests seem almost to be exaggerated; to remove the operations of railroads from the domain of a practical science to the laboratory of a professed chemist; to make them depend more upon theoretical demonstration than practical utility; to make formulas superior to the experiences of practical men, or the established value of articles; to put the manufacturer of half a century of honest practice and laborious experiments on the same plane with the novice without experience or history; to make the crucible superior to

the furnace, trade marks the foot-ball of professors, and experience the servant of theoretical speculations. There can be no doubt that, within proper limits, a laboratory is an essential thing to every railway company, but its manager must act in harmony with demonstrated experiences, in harmony with his natural ally and protector, the operating officer; otherwise injudicious practices will grow up and antagonisms be engendered that will destroy the purpose that this auxilliary force is so admirably intended to serve.

At one time, more or less apprehension existed as to the disposition of those who purchased supplies to take advantage of their opportunities to aggrandize themselves. There was, undoubtedly, some cause for this suspicion in the early history of railroads, but it was neither general nor aggravated. Mankind are not now, nor ever have been, inherently dishonest. Moreover, those who purchase railway supplies are too intelligent not to know that corrupt practices, like curses, come home to roost. Isolated offences may escape notice or permit of restitution, but continued disregard of the ethics of society cannot be remedied or long concealed. Those who practice them are at the mercy of the crowd, and their downfall is only a question of days or months. The uppermost thought in selecting a purchasing agent should be to choose a good business man of unblemished character. The longer a person thus selected exercises the office, the greater his value, the more confirmed his habits of honesty. The importance of the office of purchasing agent is not so generally recognized as it would

be if we could test its work by results, as we can in the case of many other departments. Its duties are so different and the subtleties of buying and selling so little known that its worth is not always appreciated. The operating officer makes requisition for what he wants, and the purchasing agent is supposed to go into the market and buy at the lowest figure. The acumen that he exercises is something about which his brother officers know very little. There can be no doubt that the more the importance of the office is known to railroad men, the more highly esteemed it will be and the more generously its occupant will be rewarded. Not only will he receive a salary commensurate with his services, but when no longer able to work, he will be granted a pension, a crust to live on when old. This suggestion I know will make the cuticle of the average American harden, and I think I can hear him gently inveighing against the effete practices of Europe. Vain fear! We think ourselves over wise, over crafty in such matters. We are young and isolation has made us provincial. But we shall improve! We have been brought up to see men filling positions of trust thrown off when no longer capable of good work, as we would discard a paper collar or a worn-out pair of stockings. This is the policy of the Republic—glorious with all its faults; the policy of its citizens. It is the policy of ignorance, or indifference, of present greed. We practice it and advocate it, because it has been practiced and is practiced. Its lack of wisdom will eventually be understood. We shall sooner or later recognize that it is cheaper and wiser to pension a

man during the short remainder of a broken life than to make frequent changes in his office or subject him to unnecessary temptation. The practice of pensioning men who fill positions of trust similar to that of a purchasing agent will prove valuable in many ways. It will enable governments and railway companies to hire men at lower rates and ensure their honesty when hired. Men do not steal simply that they may acquire money, but to lessen the probability of coming want. Once this apprehension is removed, the probability of their stealing becomes infinitesimal; without it, the possibility becomes a probability, as the history of office holding in the United States abundantly demonstrates. The experiences of England under similar conditions, were not different from our own, but the mistake was seen and corrected, and she has been rewarded by three quarters of a century of efficiency and honest practice. In the United States, we use a man in his prime, suck him dry as we would an orange, and throw him away; we pay him only reasonable wages and kick him out as we would a tramp, when he grows old, if not sooner discharged. Thus the office holders come and go in endless procession, but like avenging spirits, eat up the vitals of those who make them the creatures of so short-sighted a policy.

The practice of designating a particular person to buy the supplies that a railway company needs, is not universal, though more prevalent than formerly. At one time it was the custom to permit the various heads of departments to buy. The practice was based upon the

presumption that they knew better than anyone else and that their knowledge of the technicalities connected with the thing they wanted made them especially fit to buy advantageously. The argument was, however, fallacious, and it ought not to have required demonstration to prove that a person hired for his skill as a blacksmith is not likely to possess the qualities necessary to enable him to cope successfully with the veteran merchant in purchasing the goods that a blacksmith requires, or in disposing of the debris that accumulates about a blacksmith's shop. It was found, moreover, that when purchases were thus distributed, those making them were in many cases constrained to look upon the act as merely an incident of their office, something in the nature of a perquisite which they were at liberty to avail themselves of at pleasure. It resulted from this that excesses grew up where purchases were not supervised by an alert and trustworthy manager. There was, moreover, enormous waste of material through excessive purchases and duplications of orders, while prices became greatly inflated through the ignorance and veniality of purchasers. These disadvantages, were, moreover, coupled with frequent and shrewd suspicions that much of the material bought and paid for was never delivered, was purely mythical in fact. This was not only rendered possible but probable, by making the department that purchased the material and the department that received and inspected it, the same. A doubtful practice under any circumstances. These, and kindred practices, were the natural outgrowth of railway development. They were not the product of design,

but of evolution. No other method was known. Indeed, it was not supposed that any one who was lacking in technical knowledge of the use to which a thing was to be put, could be entrusted to buy it. Time has greatly weakened this belief, if it has not destroyed it entirely.

The cardinal element that makes a purchasing agent of value to his employer, is the mercantile instinct. If he has the characteristics of an artisan, he should occupy the office of an artisan. Such a person, however great his worth, is not qualified to cope with merchants, and his company will only be worsted in such an encounter.

An essential requisite in a purchasing agent, and one that he, perhaps, appreciates more fully than any one else, is promptness. The operations of railroads are imperative, and while there is abundant opportunity to economize by cutting down excessive requisitions and cancelling others, this process must not be allowed to interfere with the prompt filling of necessary orders. When it does, the service suffers thereby. The work must be done continuously and systematically. Indeed, a supervisory duty of almost any kind is more likely to be exercised wisely by a subordinate, or even a dull man, than by a higher or more capable person, if the latter is not able to give the subject the thought and attention it deserves. No one, it is probable, appreciates so heartily as the operating officers of a railroad the peculiar embarrassments that attend neglect to fill requisitions within the specified time. Such neglect involves the use of unfit and expensive substitutes, and, in many cases, stoppage

of important repairs or construction of work. Delay in the receipt of material that is needed also involves hurried and imperfect inspection when received, and a disregard of economical and responsible methods of distribution afterwards; involves not only loss, but confusion and scandal. Promptness may therefore be said to be an essential requisite.

The more the subject is studied, the more apparent it becomes that, except in peculiar and fortuitous circumstances, the interests of a company are enhanced by the employment of a particular man to buy its supplies. When they are purchased by many men, the manager must, practically, assume the duties of purchasing agent through the minute and unceasing vigilance that he will be required to exercise over those whom he designates to perform the duty. This is a duty that but few managers have the ability, time or disposition to perform properly.

In order to buy advantageously, it is essential that orders shall be far enough in advance of the need to afford the purchaser abundant opportunity to avail himself of the most desirable market in which to buy. The field is wide and requires both time and patience in order to take advantage of its opportunities. Undue haste is quite certain to add to the cost, and in many cases detract from the value of the article purchased. In order to buy cheaply, it is important that the purchaser should be wholly independent as regards the person from whom he buys. He must not only be free, but must scrutinize the various sources of supply constantly and intelligently.

In order to buy cheaply, goods must be paid for quickly and promptly. The usury that a company suffers in the generality of cases for even slight indulgence, is out of all proportion to the benefit received. An enormous percentage of the profits of many of our great merchants arises from the discounts they receive for paying cash. This discount is quite as valuable and available in the case of railways as in the case of merchants, and the fact is fully appreciated by purchasing agents. It is not, however, so generally understood by their associates, and it results that this profit is, sometimes, lost in consequence. The circumstances of the case, however, are greatly mitigated by the fact that the bulk of our railroads are such large and stable buyers that they are able to purchase much cheaper under given circumstances than those whose credit is more restricted. This is especially so where they observe their obligations in regard to time and method of payment. Under the most favorable circumstances, however, there can be no doubt that the ability of a company to buy cheaply will be greatly aided by prompt cash payments.

In buying material, the value of inviting bids whenever possible is generally recognized and acted upon. The exercise of this practice, when accompanied by the careful and unceasing "shopping" that is practiced by purchasing agents, has the effect of securing to a company every possible advantage that should attend the buying of large quantities of material in a widely extended market in which competition between sellers is both general and excessive. The value of "shopping"

and inviting bids, is not dependent upon the quantity of goods bought. The difference in the price asked, even for a small thing, by different merchants and manufacturers, is always sufficient to justify careful inquiry. Thus, in so small a matter, apparently, as the purchase of stationery that railways use, and that is peculiar in many respects to different roads, the solicitation of bids will develop the most wonderful differences in prices; differences so remarkable that the aggregate amount that may be saved by judicious buying in the course of a year, would not be believed by those who have not given the subject careful investigation. The same is true in regard to the purchase of lumber and almost every description of material.

To buy cheaply and advisedly, it is essential that the pulse of the market should be continually felt. This necessitates extended correspondence and constant and personal inspection upon the part of the purchaser. The systemization of railway business that is constantly going on will render it more and more easy each year to anticipate the current needs of a railway. One of the most effective avenues for accomplishing this will be to publicly and generally invite bids from manufacturers and others for supplies for a considerable period ahead. This process pre-supposes the preparation of careful estimates in advance and the granting of considerable time in which to deliver the goods, thus permitting the exercise of careful preparation by sellers. The constant evolution in railway practice has not rendered this practice generally possible heretofore. The purchase of rails, ties, and

kindred staple articles has, however, formed an exception to the general rule. These supplies are of such magnitude and cost, and require so much preparatory labor, that it has always been necessary that their use should be carefully anticipated and contracts made for them long in advance of their need.

Some of the most carefully managed railroads invite bids by public advertisement for a year's supply of such articles as their known wants enable them to anticipate, without reference to the magnitude of the order. This secures the widest knowledge and consequently general and active competition upon the part of sellers. It is in every way creditable to a company practicing it, and when supplemented or attended by active and unceasing "shopping," secures to the purchaser every possible advantage. While there can be no doubt that every railway company will derive great benefit from the wisest solicitation of bids, it is probable that those companies that are remote from an abundant market will be more greatly benefited by such a course, than others better located. Their necessities compel them to keep a large supply on hand, while their restricted market places them at a disadvantage in buying, unless through general and judicious advertising they invite the attention of the world to their needs.

In concluding this imperfect and limited review it may be said that no adverse criticism can fairly be made against the present methods of our great railroads in the matter of purchases. The work is carried on by them intelligently and through alert and experienced

men fully alive to the opportunities of their office and skillful and prompt in taking advantage of the same. Great advance is, however, possible in this field as in every other department of railway operations, while more general and correct knowledge upon the part of railroad men of the duties and responsibilities that attend the purchase of supplies cannot but redound to the common good.

CHAPTER IV.

ORDERING SUPPLIES. — REQUISITIONS. — SUPERVISING SAME.

The difference between ordering the supplies of a railroad and the supplies of a shop or division, is much greater than would be supposed. In the former case, the store-keeper's knowledge must be supplemented by experience, careful enquiry, and voluminous records, while in the latter, an examination of the shelves of the store-room and the material piled in the yard, will be substantially all that he needs to enable him to make his requisition. Careful records are necessary in the former case, showing the material on hand at the commencement of each month, the amount received during the month, the amount disbursed, what for, and the amount on hand. A record of this kind, kept from month to month, is indispensable in ordering the supplies of a railroad. This record, while showing how much material has been used, will, in many cases, afford no just idea of the amount to be used, as the supply is constantly

affected by extraordinary demands for construction and other special purposes. Hence, the store-keeper must supplement his knowledge by constant intercourse with the operating officers who use material.*

As nothing that concerns the operating department of a company originates with those who handle its supplies, it results that they know nothing of impending wants and it is only through those who control the work that they can keep themselves advised. Their ability to procure this information and the intelligence they display in anticipating current wants, is an evidence of their fitness. If the methods of a store-keeper are imperfect, it will be observable in his work; his orders will be lacking in perspicuity, and he will find it necessary to supplement the stated monthly requisitions with frequent orders to meet unforeseen emergencies. Material will have to be bought hurriedly and at a disadvantage, to meet needed wants or to prevent the collapse of some department of the service. The difference between a man who possesses executive talent and one who does not, is the

* It is the practice upon some roads to open a ledger account at all store-houses with each article. By summing up such an account, the exact amount of material on hand under that head is determined without going to the store-room. The amount of labor involved in this method of book keeping is very great and the expense commensurate. I have never esteemed it necessary to keep such a record, except at the general store-house, and am ignorant of any loss that has attended the neglect. The mere keeping of a separate account with each article of merchandise cannot prevent its being stolen or used without charge; the way to prevent this is to properly guard the article. I do not imagine that where a store-keeper has a separate book account with a particular article that he feels at all sure that he has on hand the quantity stated in such account, until he has made an inventory of material to see that it tallies with the book. If the inventory is necessary, then the value of the book is small, as the expense of actual inspection is nothing compared with the cost of keeping a book account with all the multitudinous articles that a railway company finds it necessary to keep in store. However, I do not venture to criticise such method of book-keeping; it has, doubtless, been found to be of practical value where employed, and those familiar with its methods are better able to judge of its value than those who are not.

difference between a good and a poor store-keeper. The former will anticipate the wants of the service with the same accuracy of judgment that a merchant anticipates the wants of his trade; if, however, he is lacking in intelligence or practical skill, his shelves will be loaded down with goods that he does not want, while there will be a scant supply of needed articles. A store-keeper of this kind is a source of constant harrassment to those about him, besides being an expense to his employer.

Proper systemization of work requires that there should be stated periods for ordering material. Upon the majority of railroads, it is probable that a month's supply is all that it will be necessary to buy in advance, if the wants of the service are carefully studied. Too frequent ordering of material is objectionable on many accounts. First, because of the expense it entails in the handling of goods, and second, in the attendant paraphernalia of accounting, including payment. Orders should cover such supply as can be conveniently, safely, and economically stored, without involving depreciation or unnecessary locking up of a company's resources. No absolute rule, it is apparent, can be made in cases of this kind. It will depend upon the situation of the railroad, the condition of the market, and the storage facilities. If the road is remote, a larger supply will be needed than in other cases, because of inability to replenish the stock at will. If the market is a falling one, a managment will confine its purchases to the actual daily requirements of the service. If it is a rising market or promises to be so, the supply laid in will be such as the resources of the

company permit, the nature of the material justifies, and the probabilities of the market warrant. It is in such things as these that the management of a road evinces its sagacity and fitness. Its success will be measured by the commercial instinct it possesses. If acute, it will be able to anticipate results; if dull or inattentive, the storm, when it breaks, will find it unprepared. It is the old story of relative fitness, with the added importance that the men interested are not operating for themselves, but for others, and therefore, lacking somewhat in self-interest. They are, moreover, not selected in many cases under the most favorable auspices; they are often chosen hurriedly and not always with a thorough knowledge of men; they are, moreover selected in some cases (though unconsciously, doubtless), from the standpoint of the employer and his agent conjunctively, rather than from the standpoint of the employer solely. All of these things affect and give color to the organization of governments and corporations.

In reference to the time for ordering supplies, probably the mean will be found to be monthly. When this is the case, the requisitions should be in the hands of the purchasing agent on or before the first of the month; this will render it necessary that the requisitions of local store-keepers should be made upon or through the general store-keeper (if there be one) at a much earlier day;—say the fifteenth. This will afford the general store-keeper opportunity to examine them before sending in his own requisition;—say on the twentieth. Where there is a general store-keeper, copies of requisitions should be sent

to him when requisitions are made directly on the purchasing agent by local store-keepers. This is necessary to enable him to know the probable wants of the property and foresee demands likely to be made upon him. When a company has a central store-house, all requisitions should be made uniformly on or through the person in charge thereof. These requisitions should be sent forward by him to the purchaser with such notations or alterations as his knowledge of the wants of the company warrants. The effect of this will be to secure concert of action and prevent purchases in excess of known wants. It will have the effect to remove questions as to supplies needed from the domain of probability to a more solid basis. The general store-keeper, moreover, is the only one having practical knowledge of the supply on hand. His duties are of such a nature as to give him accurate and early information. He sees the material, and his knowledge is therefore immediate and personal. The greater use, therefore, that a company makes of this official, the greater the efficiency likely to characterize the handling of its supplies. Where there is a general supply store it is desirable that all small supplies should be sent there for distribution.

The most perfect method of acquiring knowledge of needed material, will be more or less defective. This will render it necessary to order at other periods than the stated day of the month for making requisitions. Particular days should be fixed for these supplementary requisitions. The dates are not important, probably the first and tenth are as good as any. On these days all

material that is required that cannot await the usual requisition, should be ordered. In addition to this, there will still be extraordinary necessities that cannot await any formal period. But if store-keepers are alert in the discharge of their duties, these added requisitions will not be of frequent occurrence.

It does not alter the case that a store-keeper is dependent upon others for much of the information upon which he bases his requisitions. His ability to acquire this information will be one of the evidences of fitness. His methods must be such as the circumstances of the case require. The impossibility of using a cork-screw or augur for the purpose, will quickly suggest to him the importance of exercising tact and opportunity in attaining the information he needs.

The great supplies of railroads, such as rails, ties, timber, and equipment, are of such supreme importance and magnitude, and are governed by so many extraneous influences, that store-keepers, as a rule, have little or nothing to do with their solution. These matters the immediate management of a property control. They subject them to the most careful and discriminating enquiry as regards the needs of the property and its ability to buy. The result of their examination in this direction may be said to be in every case a compromise, the extremes meeting upon the common ground of expediency and safety.

The amount of material that a company will require to keep on hand, will, as already stated, depend on the length of time required to fill requisitions. If the time

at which material will be received is at all doubtful, store-keepers will be compelled to keep a larger supply than would otherwise be the case. Thus, delay or uncertainty involves increase in the supply carried with the attendant depreciation and locking up of a company's resources that it implies.

In ordering material, the supply should not be cut down below the reasonable wants of the service. The risks and special expenses that attend a short supply are too great to be incurred needlessly. Not only is the intelligence of an operating officer evinced in the methodical preparation he makes for supplying himself with needed material, but it is also evinced in the nature of such material; in his selecting that which, all things considered, is the cheapest and best; in his avoidance of that which has only gaudiness to recommend increased cost. Brilliant reputations are, perhaps, not made in the exercise of economies of this nature, but their value to a property is beyond estimate, not only in regard to the direct saving effected, but in the high morale they foster.

The great and permanent properties of a country are as common-place in appearance as they are substantial in structure; with them, strength and durability take the place of gaudy devices. And as there is no likelihood that picturesque needs of railroads will ever be disregarded, there is no danger that the use of the common-place and homely makeshifts possible in their operation will permanently disfigure them.

In ordering material, the technical names that attach to articles should be used. All abbreviations should be

avoided and descriptions should be supplemented, if possible, by such reference to cuts, drawings, or numbers, as may serve to explain more fully what is needed. When the article bought is different in any respect from the article ordered, immediate notice of the fact should be forwarded to the person making the requisition, so that he may inspect it understandingly, or in the event the change is injudicious, may have opportunity to correct it by subsequent representations.

The wide discretion exercised by a management in filling requisitions for material, both as regards nature and quantity, tends to create confusion and irresponsibility, if not carefully regulated. In the first place, those who order supplies should be made to feel that they are expected to confine themselves to absolute needs; that grave responsibility attaches to lack of good judgment on their part. It is only in this way that the growth of the competent and self-reliant men that a great corporation needs can be secured. If we pursue the processes of children with them, we shall only attain the responsibilities of children. When an order is changed, the person making it (no matter what his station) should be notified, and the reason given. Co-operation under any other circumstances is impossible, and both the self-respect of the man who makes the change and the man whose plans are altered will be increased thereby. The exercise of arbitrary power without explanation is always injudicious, where co-operative effort is essential. Every person in his place must be made to feel that his responsibility is co-ordinate and that he is entitled to, and receives,

relatively, the same regard that others exact. Men thus treated, attach greater importance to their actions than under other circumstances, and are, therefore, more painstaking. The responsibility that attaches to their work leads to its more careful consideration; at once there grows up in them not only the disposition, but the ability, to aid those who look to them to accomplish results. Due consideration of these things is pertinent to the subject under discussion and necessary to its elucidation. They are well known and equally well recognized by wise managers of railroads, but they are neither known nor recognized by those who lack wisdom or who view the operations of corporations from a personal standpoint. It is only through a correct understanding of the principle of cooperation between agents that we can secure high results. There can be no doubt of the truth, that the nearer those who simply serve are able to consider affairs from the standpoint of those who direct, the better agents they will make and the more interested they will be. This is the observation of every man who directs the movements of others; of the general, of the politician, and of the business man; its general recognition cannot be otherwise than beneficial to railroads.

In ordering supplies, due consideration must be given to the cost of handling and the needs of the service, yet the former must not be given undue prominence simply to avoid the work that the receiving of necessary material involves. While expense may be saved by restricting the work within judicious limits, it should never degenerate into a mere matter of convenience. In

order to secure the greatest efficiency in ordering material, preparatory books should be kept in which known wants may be entered as they arise from day to day. These books should also be furnished to foremen and others filling positions of trust, so that every means may be exhausted to ascertain the actual needs of the service in advance. As already intimated, due economy requires that all surplus material should be kept at a central depot of supply. It is only in this way that unnecessary accumulation can be avoided. It enables a company to keep the bulk of its supplies under its eye and permits it to exercise a direction not practicable when they are stored at widely separated points.

In making requisitions for material, the difference between those of the general store-keeper whose orders contemplate purchases, and the requisitions of the local store-keeper which may, very likely, be filled by a transfer from some other point, is manifest. Nevertheless, the basis of the orders is the same and they should cover a like period. Requisitions from local store-keepers should, however, as already stated, be made far enough ahead so that they may be embraced in the general requisition if necessary. Requisitions should be numbered consecutively, to facilitate clerical work.

It is not necessary to refer here to details connected with the signing and counter-signing of requisitions. These matters are dependent wholly upon the local practices of a company. They are not material; it does not matter whether a requisition is signed by the master mechanic, superintendent, or store-keeper, so that it is

authoritative and the person competent. And in reference to the title of store-keeper used herein, it is intended to designate the person immediately in charge of the material, whose duty it is to see that the supply is adequate, that it is duly cared for and properly disbursed whether the value be a dollar or a million of dollars. My purpose is not to describe what an organization should be, but simply to lay down general principles. The title of store-keeper, in the proper sense of the word, as it is understood upon railroads, refers to a particular man in charge of material at shops and other depots of supply. Foremen in charge of track, bridges, fences, buildings and other branches of the service, who keep on hand a supply of material, whether new or old, little or great, are store-keepers in a certain sense, and should be governed by the same rules as store-keepers.

Another and an entirely different class of orders from those already referred to is that made upon the various store-keepers by foremen and other operating officials, for material for work in progress. These orders, it seems hardly necessary to say, though experience proves it to be necessary, require to be restricted to immediate and present wants.*

*It is the practice in some instances, I know, for store-keepers to deliver large quantities of material to those who repair equipment or perform other work, in advance of daily needs, charging the material when thus delivered directly to the purpose on which it is finally to be expended. This saves the necessity of store-keepers keeping accurate account of material as disbursed, and insures its being charged to the proper account. The practice, however simple and direct it may be, is not justifiable, no matter how much labor it may save the store-keeper or how convenient it may be in accounting. Material not actually needed by workmen for immediate use should remain in the jurisdiction of store-keeper and should not be formally delivered to workmen, or charged to an account, except as it is actually disbursed for use from day to day.—M. M. K.

Charges against various accounts are based largely upon the orders of foremen and others. They form a part of the data used to determine cost. It follows, therefore, that when more material is delivered than is needed for the accomplishment of a thing, that the excess should be returned to the store-keeper, and in the event it has been charged to the work in progress, due credit given.

The interests of a company will be greatly advanced by enforcing the most stringent rules in regard to drawing supplies from store-houses for current needs. The clerical work connected with the making of an order, is often looked upon as a disagreeable duty and uncongenial in other respects. The disposition, therefore, is to make as few orders as possible, and to make these few cover a great deal. Its indulgence is to withdraw the material of a company from the care of the store-keeper, where it is looked after with such watchfulness as facilities permit, to a place where it has no care at all, or only cursory supervision at best. It also follows, where excessive orders are permitted, (and they are inevitable, except where constant watchfulness is exercised) that material procured for one purpose is used for another, and, while this may not involve actual loss, it produces confusion in the accounts and renders it impossible to determine cost. The tendency of this is bad, responsibility is evaded by it and a company is unable to determine whether its work is being carried on economically or otherwise. Persons ordering material for work in contemplation, should not only be required to restrict their orders to known and immediate wants, but whatever surplus

they may have on hand, when the work is completed, should be returned to the store-keeper with a descriptive statement, made with the same careful accuracy that characterized the original order.

Orders for supplies for use upon trains and at the various offices and stations, and by those in charge of track and other property of a company scattered along its lines of road, differ from those already noticed, but they require the same careful and intelligent scrutiny. Where these supplies are large, their magnitude has a tendency to make those who order them feel the responsibility attending their action, but in many instances the amount involved is petty and its consumption an incident rather than a purpose. In such cases, the necessity of economy is sometimes overlooked. The supplies thus used, however, are in the aggregate enormous, as the expenditures of a company evince. Due efficiency, therefore, requires that orders of this nature should, as in other cases, be carefully audited before being honored. The judicious "pruning" of orders for stationery and other small supplies used in the discharge of business, will not only prevent their undue expenditure, but will tend to prevent their loss or misappropriation. It is impossible for anyone not familiar with the subject, to appreciate the saving that can be effected by restricting supplies of stationery and kindred material to known present wants and by carefully ascertaining, after an order has been filled, whether the supply thus furnished is made to extend over a commensurate period. Upon some great railroads this surveillance extends to the

most minute blanks and articles. It excites, as may naturally be supposed, the most heated controversies between the store-keeper and his natural antithesis—the person ordering; the former accusing the latter of extravagance, and the latter accusing the former of parsimony and with crippling the service through his pinching economy. Such friction is healthy, if confined within reasonable bounds. It prevents undue penuriousness on the one hand and wastefulness on the other.

There is, it is probable, no more ungrateful task connected with the service of corporations than the duty of supervising requisitions and orders made by employees and officers. However absurd or excessive, they are not esteemed so by those who make them, and any change or reduction in amount excites their antagonism and chills their ardor. It is a reflection on their judgment or method, and they receive the rebuke according to their amiability or the thoroughness with which they have been disciplined to obey, but always with bad grace. In whatever light, however, such reductions or changes may be viewed, the supervisory duty must be performed, if expenditures are to be restricted within reasonable limits. Examinations must take cognizance of every article used. It must commence with orders for equipment, ties, and rails, and must follow on down the ever-lessening sources of expense to the most minute article of stationery. Each requisition must receive the measure of attention it merits, without reference to the outlay involved, for the reason that the discharge of business may be harassed quite as much by the want of a blank

as by the absence of a needed car-wheel. The supervision must, therefore, be searching and discriminating.

The auditing of requisitions must, moreover, be conducted with judicial fairness and methodical accuracy. The person who performs this service must have a benignant temper; his patience must be equal to the most exacting requirements; his experience such as fits him for the duty, and his power of application commensurate with the tedious character and ungrateful nature of the work. No single person, it is manifest, can pass intelligently upon all the requisitions for supplies that a company needs in its operation. If the property is a large one, a special man will have to be assigned for stationery and printing, another for lumber and kindred material, another for shop supplies, another for road supplies, and so on, according to the magnitude and diversity of the work. The fitness of a person making examinations is evinced quite as much in his ability to convince those whom he finds it necessary to over-rule, of the justness of his action, as in the changes he makes, as it is only by such a course that he can hope to prevent subsequent and frequent repetitions of original mistakes. He must not only be able to wisely curtail expenditures, but to enlist the hearty interest of others in his work. This quality is rare.

The tendency of those who fill responsible positions is to act independently. If the duty of cutting down orders for supplies has a disagreeable side, it also has a bright one. There is, to a zealous man, probably no greater satisfaction than to think that through his own

unaided action, he is saving his employer from unnecessary expense. The performance of such a duty seems to measure the value of a man's service to his employer more accurately than any other way. He can, so to speak, count in dollars and cents his worth. The tendency, therefore, in him, is to exaggerate, to consider the act rather than the office. The visible result accomplished tends to make the official short-sighted and selfish; to make him impatient of sharing his efforts with others. He takes pride in being able to guard his employer's interests single-handed. These feelings are exceedingly human and are, therefore, very likely to find expression. They are, however, none the less to be deplored, are none the less narrow and personal. Whenever it is necessary to over-rule an associate or subordinate, the part of wisdom is to share the credit of the action, so far as possible, with him. By doing so, we not only strengthen our present purpose, but secure an ally, and allied interest, it may be remarked, is necessary in the administration of corporations, if we would secure permanent results. Great individual reputations may not be so readily built up under such procedure, but great properties will be more likely to be constructed and maintained thereby.

Permanent results are to be attained in the operation of railroads only by making a force as homogeneous as the property it administers; by making persons subservient to the common good without destroying their individual enthusiasm and interest; by encouraging a disposition to serve the property without reference to its

agents; by striving to eliminate jealousy as far as possible from the service. This last named vice is the curse of corporate life, and is, with envy, the meanest trait that the soul is capable of. They are the natural inheritance of selfish men. They are, in corporations, the outgrowth of fear that others may acquire that which we have, or something better. They are an indication of cowardice, of a groveling disposition. They prevent the development of men and systems, and render their possessors unfit to exercise offices of trust.

CHAPTER V.

RECEIVING AND INSPECTING SUPPLIES.

The importance of inspecting material properly, requires to be kept in mind in buying. It is not enough that supplies are bought judiciously; intelligent measures must be taken to see that that which is bought is received as regards quantity and quality. The duty of inspecting material, it is manifest, requires accuracy, intelligence, and a technical knowledge of the thing inspected. This knowledge is not to be found in any one man. Different inspectors will be required, possessing especial knowledge of the thing they inspect, according to the nature of the material. The intelligence and experience they require must, moreover, be supplemented by integrity of the highest order; by a disposition that cannot be inveigled into describing a thing otherwise than as it is. These qualities are not rare among the employees of

railroads, and capable inspectors are not, therefore, difficult to find, but the peculiar qualifications required must be remembered in making selections for the office. The clashing that is inevitable between seller and buyer as regards quantity and quality of goods delivered, is greatly lessened, if the office of inspector is worthily filled. In order to quiet disputes, he will avail himself of every incident connected with the discharge of his duties, that will enable him to demonstrate to the shipper the accuracy of his inspection. It cannot be too strongly impressed upon inspectors, that the good of their employer requires that they should be entirely fair in their work. A company's interest can never be enhanced by attempts on the part of its agents to defraud the seller. Honesty, in this as in everything else, is the only policy and should be the standard. A contrary course quickly creates suspicion, rendering merchants unwilling to sell on as favorable terms as they otherwise would. They will, in such cases, take measures to protect themselves, and it is quite likely will offset the dishonest practices of the inspector by unfair means in other directions, quite likely by bribing the inspector himself. Indeed, such attempts may be made without any precipitating cause on the part of a company, but they are not so likely to occur if the inspector is entirely straightforward in his duties. The danger, however, that inspectors may be improperly influenced, requires that the greatest care should be taken in selecting them, and in governing them afterwards. Veniality in this direction not only involves payment for goods never delivered, but payment for inferior goods.

When material is deficient in any respect, either as regards quantity or quality, the fact should be carefully entered on the invoice, or if this document is not at hand, the precise nature and quantity received should be accurately noted, to be reported in due season to the proper official, so that payment may be made in accordance with the facts. The practice observed when material does not conform to the purchase, is not uniform. In some cases it is returned; in others it is held to await further correspondence. Sometimes such use is made of it as the exigencies of the service allow. The only safe course is to insist upon the delivery of that which is bought; any other entails endless confusion and possible loss. Circumstances will, however, arise when the delivery of an article that does not meet the requirements of the purchase is unintentional, or the service will permit of its use without detriment. In cases of this kind, it should be laid aside and the facts fully reported to the proper official for his decision. If favorable, the exact nature of the material should be noted and the record book and the invoice made to conform rigidly thereto. A very large proportion of the material that is bought for railroads, requires that a sample of the thing purchased shall be sent to the store-keeper, in order to enable him to inspect it intelligently. This practice should be rigidly observed whenever necessary. It is only by such a course that sellers can be held to a rigid responsibility. The great difference that exists in regard to the particular kinds of goods furnished by different men, or the same men at different times, renders

any attempt to inspect them accurately, impossible, except by comparison.

While great care is required to be exercised in inspecting and receiving material in all cases, it is manifest that greater responsibility attaches when the material is received directly from the seller than when received from another store-house. Mistakes or omissions in the former case may involve loss in many directions, and are certain to breed demoralization, whereas, if the material is simply a transfer from a depot of supply, the circumstances attending the receipt and inspection are not so important; though efficiency requires that the work should also be intelligently and methodically performed in such cases, and that all discrepancies should be carefully reported to the shipper.

Whenever it is possible, the price of each article should be marked or painted thereon when received, so that it may be easily and quickly determined afterwards. In the case of castings and other heavy material, the weight or quantity should also be noted on the article, so as to facilitate distribution. It is also desirable in many cases, where the name of the manufacturer or seller is not plainly branded on the article, that some mark shall be placed thereon that will facilitate its identification afterwards, in the event it should prove to be defective or otherwise than as agreed upon. In the case of round iron, this may be done by painting the end or a portion thereof with some distinctive color. It will never be difficult for the store-keeper to find some simple and

effective way to mark material, so that no matter where it may be used afterwards, it may be identified.

The practice of accepting material before it is unloaded should not be observed except where it is of uniform quality, or no object can be gained by minute inspection. As a rule, material should be inspected by a competent person, in detail, as it is unloaded and placed in the store-house. In receiving material, accuracy in inspecting will frequently require that the store-keeper shall invite the advice of foremen or others having practical knowledge of the article and the uses to which it is to be put. The judicious use of such sources of information, in all doubtful cases, cannot but redound greatly to the efficiency of the work.*

The details to be observed in regard to the method of inspecting material, it is manifest, can only be generally referred to. Each class of material possesses characteristics peculiar to itself which must be taken into account by the inspector. To attempt to define the duties of the examiner in detail would, in many cases, require an accurate technical description of the article used — an absurd and impossible task. Moreover, the question as to whether an article comes up to standard, cannot in many cases be determined until after it has

* It has been suggested, that where the bulk of a company's supplies are delivered to it at some particular place other than a store-house, that a receiving or transfer room should be located at such place and a store-keeper assigned to receive and ship material. This would, it is suggested, facilitate distribution and permit inspection under the eye of both seller and purchaser, a thing impossible when a company does not accept material until its arrival at a store-house located at some interior point.

been used. This is so in regard to rails, car-wheels, axles, and similar material. To meet such cases, the store-keeper must keep an accurate account of the date of the receipt of material, when put into use, time in use, condition of use, and such other details as the necessities of the case involve.

One or two practical illustrations of the details connected with the purchase and inspection of material may be inserted here for purposes of illustration: thus, the bids of one road for ties recite:

"All ties must be well and smoothly hewed or sawed out of sound, straight, thrifty timber; must be eight feet long, exclusive of the kerf; must be uniformly six inches thick between the faces; each face side to be six inches wide or upward at the narrowest place, inside the bark, and the faces to be straight, truly lined and parallel with each other. If ties are sawed or split from large timber they must not be less than eight inches wide on face side, and free from wane, shakes or unsoundness of any kind. The ties to be delivered on ground at or above the grade of the railway track, and within thirty feet of same, subject to the inspection and count of the purchasing agent, or any authorized agent of the company, whose action in counting and receiving or rejecting the ties offered shall be final and conclusive; inspection will be made once a month, or oftener if required, and payments will follow within thirty days thereafter; station agents will furnish, upon application, the necessary blanks for making proposals. All persons desirous of furnishing ties on the above named terms and conditions, will make application through the inspector, who will issue permits; no person will be allowed to place any material on the right of way of the company without special permit to do so."

And for wood:

"All cord wood to be well manufactured out of sound, straight, thrifty timber; to be cut four feet in length, measuring half the kerf, to be well corded in single or double ranks, six feet or eight feet high, the ranks not to be over two hundred feet in length, a space to be left at the end of each rank of at least eight feet before commencing another pile; the wood to be piled on longitudinal sticks sufficient to keep it from the ground, and in all cases, to be piled on the ground at or about the grade of the railway track; the end of each rank to be substantially stayed by a good abutment; a space three feet wide to be left between the ranks, if piled in single ranks, or the same space between every two double ranks, if piled in double ranks, so that a man may pass conveniently through for the purpose of inspecting and measuring the same; no round wood to be delivered that is more than six inches in diameter, or less than three, and no split wood that exceeds nine inches in greatest through measurement; no wood to be piled within one hundred feet of a crossing. The said wood to be delivered subject to the inspection and measurement of the purchasing agent or any other agent of the company duly authorized to inspect and measure the same. The decision of the said purchasing or other authorized agent, in regard to the inspection and acceptance of the wood delivered, and the measurement of the same, or in regard to the rejection of the whole, or any part thereof, for non-compliance with these specifications, shall be final and conclusive. Hard and soft woods must be piled separately. Measurements will be made monthly, and, until measured, the wood will remain at the risk of the owner."

Various methods are enforced to insure clerical accuracy in accounting for material received. One method advised, is to enter the material item by item on a blotter as it is unloaded. Afterwards this is compared with the invoice. One purpose of this practice is to prevent collusion, though it is not quite apparent how this object is accomplished. If it is the purpose of the inspector to report more material than is received, or material of a different kind, it is not necessary that he should have the invoice before him; the nature of the irregularity may be agreed upon privately in advance quite as well. In receiving freight at stations consigned to merchants and others, the goods are compared item by item with the way-bills as they are unloaded from the car and all check marks and reference to excesses, deficiencies, damages, etc., noted thereon. This practice has been found to work admirably and it would seem to be the proper course to pursue with material, except that the invoice should be substituted for the way-bill by store-keepers, or used in conjunction with it. Discrepancies are more likely to be noticed, and accurate account taken, if goods are compared with the invoice as received and all tally marks and notations in regard to material indelibly marked on such instrument at the time. The number of the car and date received should also be inserted. If the invoice has not come to hand, when the material is received, the stub or copy of the requisition may be used. There must also be entered on this stub or copy, the date of receipt of goods, the number of car, and the name of party from whom the

goods were purchased. The insertion of these details on the stub or copy affords not only information when needed, but may be made aids to prevent duplication of invoices. Invoices should never be receipted without reference to the stub or copy, care being taken to see that the details referred to are duly entered thereon and the further fact noted on the stub that the invoice has been signed, giving date of such signature. The absence of these details on the stub or copy will be an indication at all times that the material ordered has not been received, or not invoiced, and will enable the store-keeper to ascertain the state of affairs at a glance. The use of these original sources of information will save clerical labor and avoid dangers likely to occur from the use of copies.

In reference to the acceptance of material at points remote from the store-house, the inspection must be carried on, in many instances, without the invoice or attendant information in regard to the exact quality or quantity. In such cases, the amount should be entered in a memorandum book, which should be forwarded at the end of the month, or oftener when required, to the store-keeper, to be duly compared with the invoice and spread upon the books. Such disposition will frequently be required to be made in the case of material for track, buildings, fences, and other structures located on the line, and forwarded to the place to be used without inspection at an intermediate point. In such cases, the foreman or person in charge, must be depended upon to make the necessary examination and report to the proper

person. The report thus made should also state the purpose for which the material is to be used. Should it be proven subsequently that the material is in excess of the wants indicated, the fact must be reported, so that the books may be corrected, as in other and similar cases. To facilitate the receipt of material at remote points, in the absence of a store-keeper, the original invoice should be sent, if possible, to the place where the material is to be delivered, so that it may be used in inspecting and receiving as in other cases. A duplicate invoice should be sent to the store-keeper in charge. When the original is thus forwarded for use in inspecting, there will be no necessity for using a memorandum book, and it is probable that the invoice can be sent, in the majority of cases, either by the seller or the store-keeper in charge if due preparation is made. It cannot, however, be too carefully impressed upon foremen and others receiving material under the circumstances stated, that the utmost care must be observed in inspecting and counting, as imposition is much more likely to be practiced under such circumstances than in ordinary cases. In the purchase of material, invoices should precede delivery, so that these documents may be made available in inspecting and checking. These invoices, and all reports upon which payments are based, should afterwards be carefully labeled and filed away for convenient reference or should be attached to the voucher upon which payment is made.

CHAPTER VI.

CARE OF MATERIAL.

The care of material requires adequate provision to secure it against damage by the elements or removal without the knowledge and permission of the store-keeper. For reasons already referred to, this provision is lacking in many instances. The fact that a railroad company must keep on hand an enormous quantity of supplies, seems not to have been known, or if known, not to have been regarded by those who planned our railroads in the first instance. Thus, we see fuel depots that cannot be enclosed nor the supplies protected from the elements, repair-shops without store-houses, store-houses that do not protect their contents, and so on. Where room for storing new material is scant or has been wholly neglected, provision for old material, as we may readily suppose, is still more meagre. Those who planned our railroads did not adequately appreciate the value of a company's material, or regard the fact that the handling of it directly influences the cost of operating. This was, of course, a mistake. Not one drop of oil can be wasted, a spike rendered worthless, a penny-weight of iron allowed to go to waste, an ounce of fuel misappropriated or subjected to unnecessary depreciation, that does not add so much to the cost of operating. The extent of such losses, therefore, measures the amount that a company pays annually for original mistakes or present neglect to correct them where they admit of correction.

In the first place, a store-room should be so located that goods may be unloaded into it directly from the cars. The floor of the room should be on a level with the car door; the store-room should be fire-proof; its floor of concrete; its roof of slate. Material should, so far as possible, be concentrated in one building, so that the supervision of the store keeper may be comprehensive and constant. The provision for storing should be sufficient to permit every article to have a place assigned it, so that its location may be accurately known and access to it systematic. If possible, the store-house should be divided into sections, each section being lettered. The classes of material that each division contains should be catalogued and the section in which it is placed numbered. This provision will enable store-keepers and their assistants to locate articles accurately and quickly and will insure their being placed where they belong. It will also enable an inexperienced man to quickly learn the business. This last is important, as it is frequently necessary to break in new men.

The more intelligent the provision that is made for the care of material the greater concentration there will be and per consequence the smaller the stock necessary to be carried. Concentration permits careful supervision and accurate information in regard to supplies.

In regard to the practical details connected with the storing of material, it is probable that the devices used by merchants, (waiving the provision they are compelled to make for purposes of display merely) will be found to be best adapted for use at railway store-houses. Thus,

racks will be provided, suitable for the purpose, for different kinds of sheet and bar iron and will be located conveniently for use, and in such a manner that the quantity may be determined at a glance; care will be taken to keep articles similar in appearance but differing in value and utility, distinct;* oils, varnishes, and other liquids, will be kept in cans or tanks provided expressly, and so arranged that they may be filled at the minimum cost and from whence supplies may be taken as needed, without loss and at the lowest expense; dry paint and material of the nature of emery, including powders of all kinds, will be kept in bins, the same as those in which grocers keep sugar; the shelves will be arranged so that the contents of the various compartments may be easily and fully determined at a glance; material that cannot be put in the store-room will be protected by sheds, and when this is impossible, will be lifted from the ground so that only the minimum amount of damage may accrue from exposure; every appliance for handling material economically, such as derricks, rollers upon which to coil rope, dog chains, pegs for hose, and similar contrivances, will be used where the amount of material justifies; goods will be arranged with a view to their use, those which are most frequently in demand being the most accessible; articles such as locks will be carefully tied in packages, so as to prevent the parts be-

* The necessity of this is illustrated in the case of iron; that of a common quality being worth two cents per pound, while another kind, identical in *appearance*, is worth seven. Distinctions of this nature must be observed in storing.

coming separated; patterns will be arranged in order and catalogued, and so systematized that when one is removed a record of its disposition will be put in its place as a convenient reference and constant reminder of its absence; lumber and timber will be classified and piled up with the care and method that is observed in lumber yards; store-rooms will be kept clean and orderly and such expedients and devices used as the best knowledge in regard to handling material suggests, or the discipline and morale of the force requires. Method and order will reign in every department in fact.

Where material is stored in yards, or may be used without the knowledge of the store-keeper, an inventory of it should be taken daily and charges made to harmonize therewith. It is only by frequent supervision of this kind that abstraction of such material may be noticed, and unless noticed at the time the uses to which it is put cannot be ascertained. Old material should be carefully assorted, according to its value, as fast as it accumulates, and forwarded to the central depot of supply, or other disposition made of it as circumstances will permit.

Access to the supplies of a company, should, so far as possible, be denied to all those not directly concerned. Approaches to supply depots should be as restricted as possible, and under the immediate eye of those directly responsible. When the facilities do not provide adequate storage room for the coarser articles of material, they should be concentrated in particular places, so as to avoid the ragged appearance and demoralizing tendency

that their presence excites when scattered indiscriminately about a yard. Moreover, such course permits of greater security and economy in handling, and renders it possible to determine more accurately and readily the supply on hand.

The greatest losses that a company suffers in connection with its material, are probably those of its fuel supply. The inadequate provision originally made for its proper storage cannot now, in many cases, be corrected, and the resulting consequence is that these depots of supply cannot be enclosed and are often open to the depredations of the public. In many cases no provision has been made, or is possible, for protecting a company's supply of wood. It lies scattered along the track, suffering constant depreciation, and liable at any moment to be set on fire by incendiaries or sparks from passing locomotives. The substitution of coal for wood throughout the United States has been a source of great saving to railroad companies, in the opportunity afforded for protecting it from depredation. The facilities for handling coal, while not perfect, are still much more complete than for wood. They admit of its adequate protection, in the majority of cases, in enclosed and protected sheds and its easy and economical disbursement therefrom.

The care of material at each store-house should be entrusted absolutely to a particular man, whose jurisdiction should include the force employed in connection therewith. This concentration of duty and responsibility, while it may, perhaps, seem in some cases to add to the

cost, will really be found to be more economical than any other method. It is only by concentration that responsibility, both as regards the care of material and its economical handling, can be secured. Under any other method there will always be more or less men employed in handling material who are charged to some other account or who appear under some other head. This prevents accurate knowledge of cost of handling and consequently engenders irresponsibility. Two men will frequently be employed under such circumstances to do the work that could be accomplished by one if it were carried on under the direction of a person immediately conversant with its needs. Moreover, it is only by concentration that safeguards can be thrown around material to prevent its disbursement, except under given rules and for necessary purposes. Under any other method it will be taken without orders, without being charged, without due necessity, and in excessive amounts. Thus there will grow up every pernicious habit that irresponsibility engenders. Where the amount of supplies stored requires a man to receive, care for and handle them, there a store-keeper should be provided; his pay may be commensurate with his services, but he should be selected with a view to the duties to be performed and should be known as the store-keeper.

The place in which supplies are stored at shops, cannot be located too near to those who use them, provided the protection is such as to prevent them being taken except under authorized rules. The nearer mate-

rial can be stored to those who use it, the less expense there will be in going to and from the store-house, and the less the cost of handling.

The due care of material requires that the amount in stock should be kept as small as possible. Whenever there is anything on hand that is not likely to be used, the fact should be immediately reported to the proper official. When the supply of an article is excessive at a local store-house, or is not likely to be used, it should be shipped to the central store-house or notice of the surplus forwarded to the proper official and his advice asked as to its disposition.

The store-keeper's duty, it should be carefully kept in mind, does not end with the delivery of material for use. He must, so far as possible, follow it afterwards, until it is actually consumed; he must take note of the manner in which it is consumed, see that its use conforms to the purpose for which delivered, and that it has been economically used. Due and proper handling of material requires that the store-keeper should be something more than a drudge with no higher duty than to put the material on the shelves and hand it out when ordered. He must watch it from the moment it comes into the possession of the company until it is worn out, and if, afterwards, it has any value, see that the residuum is sold for what it is worth. He must possess sufficient business talent and tact to command respect and avoid the disputes that absence of these qualities engender.

Where adequate provision is made for handling material, the duties of the store-keeper will be greatly

lessened; where this provision is wanting, the difficulties will be increased and his perplexities multiplied. The latter condition, however, will be found to be of most frequent occurrence and the added difficulties that attend will serve to test the ability of the store-keeper to the utmost.

One of the misfortunes that inadequate facilities entail, is that separate provision cannot be made for particular articles, rendering it necessary, in many cases, to pile goods promiscuously together; a store-keeper should, as far as possible, study to make such disposition of the space allotted as to avoid this difficulty with its attendant increase in cost of handling, lack of knowledge of supplies on hand, and deterioration from want of proper care. It behooves him to remember at all times and places that men are discreet and watchful according to their responsibilities, and that the wise use of material will depend largely upon the care with which it is disbursed and looked after subsequently. He will discover that greater importance is attached in many cases to the completion of work at a particular time or in a particular manner, than to cost; that men, in many cases, take no cognizance of values.

Intelligent management of a property requires accurate exhibits of the cost of every class of work that is going on. This information, in order to be valuable, must be minute. It must take cognizance, first, of the total cost of a thing; afterwards, of its minute subdivision. A great property, like a railroad, cannot be operated economically or wisely under any other method. The

size of a property is immaterial if its disbursements are itemized and studied afterwards.

A thousand miles of road may be watched with as much care as a mile. But the information must be copious and accurate, and the supervision methodical, untiring and intelligent. Charges against work in progress (whether it be a tin dipper or a locomotive) must be based on the work performed and the material used. This requires careful accounting. It requires that store-keepers shall charge the actual amount disbursed to the thing upon which disbursed. No more, no less. To do this they must know what material is disbursed. This requires that they should have charge of the material. This, in turn, demands that such protection shall be thrown around it as to prevent its being used, except as disbursed. At present, these facilities are not always provided, and at many points never can be adequately; but the more thoroughly the question is studied, the more adequate the provision will be, the more skillful the use that will be made of the limited facilities that original errors and omissions have left; whenever possible, convenient and secure store-rooms will be constructed of such amplitude as circumstances permit, and sheds will be erected to supplement these facilities when inadequate, or such other provision accorded as the nature of the supplies demand; temporary devices will give place to those of a permanent nature and greater consideration given to the value of the thing to be cared for. The subject requires the same forethought that the storage of engines and machinery and the pres-

ervation of freight receives. According to its measure it should receive the same consideration that attends the construction of a machine shop, warehouse, elevator, office or station; a consideration that estimates in advance the uses to be made of it, and that locates it conveniently both for receiving and disbursing. The mistakes of the past cannot be wholly remedied, but they can be alleviated in many cases and may be entirely avoided in future.

Adequate care of material requires that provision should be made for preventing fires and for extinguishing them when they occur. The steps taken in this direction by some of the English roads would fill a small volume. Whether the risk justifies the expense, is a question. Certainly, the precautions they take have a tendency to prevent fires and to minimize the risk attending them. The practice upon English roads is to organize a voluntary fire brigade, a small sum being allowed the members thereof by way of gratuity. Officers are appointed and each brigade is drilled at frequent intervals to perfect it in its work. In case of fire, the official immediately in attendance assumes command. Every building is provided with appliances for extinguishing fires and every member of the fire brigade supplied with a book of regulations instructing him what to do and furnishing him with a list of appliances in his district and noting their location. These instructions are too voluminous to be even summarized here, but their value would no doubt justify their procurement by American managers from the English companies. Wherever the elaborate devices

of the English roads are found to be impossible, or others of equal effectiveness are not provided, the most effective use possible of more simple appliances should be made. The best and most economical that occurs in this connection is the use of barrels filled with water (with pails sunken therein) kept constantly ready for use wherever material is stored. This precaution, with the use of portable fire extinguishers, will, if judiciously applied, afford very fair protection at very small cost. The devices must, however, be carefully looked after from day to day and the force drilled in their use.

CHAPTER VII.

SPECIAL REFERENCE TO TRACK, BUILDING, BRIDGE AND FENCE MATERIAL IN HANDS OF WORKMEN.

While certain principles and methods are applicable to all material, there are special features connected with different kinds of supplies that invite particular consideration. This is especially so in regard to road material, oils, manufacturing and repairing, brasses, old material, tools, fuel, and construction supplies. The enumeration might be still further extended if time and space permitted more detailed consideration of the subject. The list, however, comprehends the more important exceptions.

The first we will notice is :

TRACK MATERIAL.

Supplies to be used in repair and maintenance of track must be ordered, primarily, by the various section foremen. These orders should be supervised by the inspector or roadmaster and should then be forwarded to the division superintendent or official immediately in charge for certification. The limited facilities that section foremen have for storing material, makes it desirable to restrict the amount in their possession. They require enough to carry on current repairs and meet extraordinary exigencies. They should, however, as a rule, never carry over a month's supply, and it is possible that their stock may be replenished even more frequently than this in some cases. The track supplies of a company should be kept, with its other material, at a central store-house and should be sent from thence directly to the section foremen as needed. There is no necessity or special utility in separate supply depots for track or other material, and their existence can only multiply expenses. The greater the concentration of material, the less the cost of handling and the greater intelligence in disbursing. The multiplication of store-houses should be carefully avoided. They are required on different divisions, and at various centers where equipment and tools are repaired, but there is no necessity for more than one store-house or one store-keeper at any particular point. If the latter performs his duties in harmony with the requirements of his office, all orders upon him, no matter by whom made, will be filled with the same intelligence and promptness

as if acted upon by men more immediately responsible to the person ordering. If he does not, it indicates that he is incompetent or indifferent. The remedy lies in his dismissal or admonition and not in the creation of another office. It is just as proper to have two superintendents for a division, or two master-mechanics at a particular point, as to have two store-keepers at the same place. If there is more than one store-house, one store-keeper should be appointed to take charge of the whole, all others acting in subordination to him. Such concentration permits the utilization of the force employed where and when needed, its reduction to the minimum and such concert of action and intelligence in regard to the stock of material on hand, as to prevent unnecessary accumulation.

When material is forwarded to a track section, it should be charged to the section receiving it, the same as if it were forwarded to a store-house. The store-keeper or accountant in general charge of track supplies should open a material account with each section, the gross debit to these various accounts making the total amount of track material on his book charged against him on the general books. Foremen in charge of sections, should be required to acknowledge the receipt of material and make returns at the end of the month the same as other store-keepers, showing the amount received during the month, amount used, for what purpose, and amount on hand. Such a system of returns is not difficult to maintain and will render it easy for officials to exercise a proper supervision over track supplies. The lack of clerical skill upon the part of section foremen is so well

understood, that it was the general custom at one time not to require from them any report whatever of material received, used, or on hand. It was assumed that they could not make such a return and material was charged directly to the operating or construction account (whichever it was intended for) when sent to the section, instead of waiting until it was actually used, which latter event might be weeks or months afterwards. This was a very simple way of getting it off the books and into Expenditures, but its tendency was to encourage wastefulness. The books failed to show the quantity of material on hand or where located, and the resulting ignorance encouraged excessive accumulations of supplies and careless handling. The belief in the lack of clerical skill on the part of section foremen was partly real, partly imaginary. Any extended statement is difficult for many of them to make, but they can set down figures, and if the names of the articles are printed and they are only required to enter amounts opposite in columns provided therefor, they can carry on a system of accounting that answers very well as a basis for those at headquarters in writing up the records. Different methods of accounting have been devised for securing a correct system of track accounts. One was introduced by the writer several years ago and has worked very well. It does not contemplate any book-keeping on the part of section foremen, but that they shall make such returns of material received, used, and on hand, as to permit the store-keeper at headquarters to determine accurately in regard to track supplies.

The disposition of those in charge of track to order more material than is needed, is not probably greater than that of any other department of the service; nevertheless, economy will be greatly enhanced by careful scrutiny of the returns. The peculiar exigencies of the road department require that each section should have such tools and supplies as may be necessary to meet current wants and extraordinary contingencies, such as storms, accidents to trains, and kindred mishaps. This necessitates a certain flexibility not necessary where these imperative conditions are absent, but the disposition to exaggerate, without knowing it, the wants that these special exigencies call for, will be more or less apparent and must be met by attentive and careful oversight.

The proper care of material in the hands of section men needs to be constantly looked after. All old material that has accumulated, except rails, should be collected daily and stored in some convenient and safe place. Tools and supplies of all kinds should be so guarded as to prevent their being misappropriated or damaged. More or less losses are suffered unavoidably in connection with both new and old track material in consequence of lack of storage facilities. In some instances, no provision whatever is made. In many cases, however, proper use is not made of the facilities that are provided; care is not taken to store new material, and old material, instead of being collected promptly, lies scattered along the line. Economy and efficiency require that wherever facilities are lacking, the evil should be corrected as far as possible; that where they are pro-

vided, due use shall be made of them. It is not necessary to especially refer to the inspection of track material here. Its peculiar nature requires the services of experts in such matters, and in order to secure responsibility on the part of sellers, much material must be watched long after its insertion in the track to determine its quality. One familiar with the inspection of track material writes:

“The inspection of track material is important. Angle bars, by reason of worn rolls at the mill, will come in such shape that they cannot be fitted to the rail properly; rails are oftentimes defective; track bolts fall short of the required length, and split bolts have only the semblance of a split and are consequently unfit for use. In fact, track material needs a good deal of careful watching if a company expects to get what it pays for and receive what it wants.”

In order to simplify the ordering of material by section foremen, they should be supplied with a printed list of the articles they use, so that all they need do is to enter the quantity opposite the article and sign their names thereto. The point to be aimed at in track accounts, should be to reduce the labor of section foremen to the minimum. This can best be done by using printed forms for such returns as they are required to make of material received, used and on hand.

BUILDINGS, BRIDGES, FENCES, ETC.

Many of the conditions that attend the use and handling of track material are observable in connection with bridges, culverts, fences and buildings. Their con-

struction and maintenance require material to be widely scattered, rendering it exceedingly difficult to protect it or for a store-keeper to locate its whereabouts or ascertain its use. To do this it is necessary for him to require returns from foremen of the material used on each structure, where procured, etc. A separate account should be opened with each lot of material located along a line to meet contingencies, or forwarded for particular use. This will require that the store-keeper in charge should have almost as many accounts on his books as the store-keeper in charge of track supplies. The reports rendered him by foremen, while not as accurate in many respects as they should be, will afford him much of the information he requires, and when lacking will, at least, give him a hint of what is going on, so that he may make other disposition. Amongst other embarrassments, he will experience the difficulty common to every department of the service, namely, the difficulty of securing accurate information in regard to the disposition of material left over after the completion of a work. This is one of the most prolific and stubborn sources of error in railway accounting. The material ordered for the construction or repair of a particular thing may be said to be always in excess of the amount needed. What the amount of this surplus is and what becomes of it, it is necessary the store-keeper should know in order to keep his books accurately. But his necessities in this direction are neither appreciated nor regarded by those who carry on the work, and unless he is constantly on the alert and minute in his enquiries the amount or dis-

position of the surplus, in many instances, will never be known. This may not involve any actual loss to a company, but it involves irregularity in accounting, and invites, if it does not precipitate, extravagance and irresponsible practices. The surplus in every case is used upon something different from the thing charged. Thus, if not reported, one account will be debited with more than it should, while another will be charged with less, or perhaps not charged at all. These irregularities, the result of oversight and ignorance, are well known to railway officials and are unavoidable within certain limits, but not to an extent that invites extravagance or evades just responsibility.

The difficulty of protecting the supplies used in the construction and maintenance of buildings, bridges, and similar structures scattered along the line of a railroad, are so apparent as scarcely to need reference. The subject is referred to elsewhere herein. I have nothing new to suggest in connection with it. The utmost protection it is possible to afford such material is more or less imperfect. In order, however, that the matter may be constantly kept before the eye of those responsible, an account should be kept of each lot or article of material scattered along the line, no matter where located or how great its relative value or importance. This will serve as a constant reminder to those in charge and will prevent material being overlooked or forgotten. This is, so far as the store-keeper is concerned, about all that he can do towards protecting and caring for it. He should, however, require frequent and special reports from foremen

and others of each lot of material located along the line or elsewhere, so as to discover any omissions or inaccuracies in his returns.

CHAPTER VIII.

SPECIAL REFERENCE TO OILS.

The losses that railway companies have suffered, and continue to suffer, in consequence of the neglect to provide adequate facilities for handling material, in the first instance, has nowhere been so marked, so great, or apparently so unnecessary, as in connection with oils. Wherever facilities are inadequate in this connection, losses are constant and as a rule out of all proportion to the cost of correction. This fact is as apparent to the passer by as it is to those familiar with such matters. The losses railroad companies have suffered in this direction, would, it is probable, be sufficient to afford a large dividend upon their aggregate capital. The practice of allowing oil to stand in barrels in the open air until used, was at one time well nigh universal. About these barrels the earth was sodden from continual drippings, while the evaporation was as constant and marked as it was offensive to the smell. It is probably no exaggeration to say that the annual loss of oil is greater than would be the cost of providing permanent, ample, and secure accommodation. The neglect, wherever it exists, arises primarily from the fact that the earlier railroads did not contemplate the use of oils in the shape and to the extent

that we now use them. The absence of provision in such cases led to neglect to provide it after the wants of railroads in this direction became known. Wherever the omission exists to-day it is either an oversight, or a matter held in abeyance, awaiting the development of some purpose yet to be consummated. Meanwhile the waste is going on and is just as much the source of loss as if a company were to take a certain amount of gold out of its vaults each day and throw it into the sea.

The facilities that must be provided for the care of oils will, of course, depend upon the quantity used; they should in every case be such as to prevent leakage or evaporation. Where the quantity justifies, a separate and fire-proof building should be provided for storage. Tanks in which oil is stored, no matter whether in a general store-house or separately, should if possible, be sunken beneath the floor, so that they may be easily and quickly filled and the risk from exposure reduced to a minimum. The oils thus stored may be drawn by pump as needed; or, if intended for re-shipment in large quantities, some more convenient means for emptying the reservoirs may possibly be provided. Where the quantity used does not justify a large reservoir, small tanks conveniently located in the store-house or in an apartment adjoining it, may be used. Oil should be unloaded without delay on arrival. Wherever facilities are lacking and it must be left in barrels, these barrels should be kept wet, especially those containing kerosene. In some instances of this kind, I have known oil to be stored in water houses where the dampness and con-

tinual dripping from the engines and tanks prevented leakage or evaporation. Under no circumstances should oil be left in barrels exposed to the sun; the most meagre accommodation is better than this and the small expense that a rude shed involves cannot excuse its absence when other protection is wanting. Where facilities are inadequate, the supply of oil kept on hand should be reduced to the minimum. Where adequate, it is probable a month's supply at least may at all times be kept on hand to advantage.

The cost of oil is relatively great or small, according to the intelligence and fidelity observed, first, in purchasing; second, in storing; third, in disbursing; and fourth, in its use afterwards. Its economical use has been given much careful thought. But notwithstanding this, the ties and roadbed of many lines are black with the supply that has been spilled in handling and from overloaded receptacles. The saving that may be effected by the exercise of care on the part of those who lubricate equipment and attend to the disbursement and use of oils for lighting purposes, is much greater than would be supposed and requires that constant and intelligent effort should be put forth to secure the best results, first, by rewarding those who are provident, and second, by admonishing those who are otherwise.

The economical handling of oils requires, like every other material, that the person using it be conscientious. He must also possess experience and good judgment. If reckless or lacking in discretion, he will use it to excess with a view to prevent "constructive" as well as ordinary

mishaps, *i. e.*, will use a quart when he should use a pint, for fear of the *possibility* of a journal heating. The happy mean in its use is to determine the least quantity that will answer the purpose required without risk or detriment. The lack of uniformity in the quantity of oil required by different machines (generally alike or of identical pattern) is well known to practical machinists. Improper alignment, defective bearings or inferior quality of metal increases the consumption of oil. These differences greatly lessen the value of statements exhibiting the comparative use of oils by machines performing the same kind of work and must be kept in mind in using statistics of this nature.

The superior utility of high priced oils makes them universal favorites. The determining factor, however, all things considered, should be cheapness. Ease in handling or convenience and cleanliness, while important factors, should be held subordinate to the question of relative cost. That kind of oil which, all things considered, is cheapest, is the kind that should be used. In disbursing it for use on locomotives, the amount should not generally exceed the requirements of a round trip; stations should be restricted to a month's supply; local supply depots for lubricating cars, supplying trains, etc., to immediate needs, not exceeding a month's supply in any case. The more the disbursement of oil can be restricted (without transgressing the limits of safety) the more the necessity of its economical use is emphasized. Frequent and limited disbursement also enables the store-keeper to scrutinize its use much more carefully than he other-

wise would. It is not so likely to be used to kindle fires and for other extravagant purposes, under such circumstances.

The economical use of oil should be stimulated in every way. This is one of the purposes that locomotive statistics are intended to serve. Among other valuable information, they give the consumption per mile run, and while this is dependent upon the weather, the load, and the engine, still it affords generally a correct indication of the relative economy practiced. Saving may be further encouraged by daily or monthly bulletins showing those who are the most careful in its use, and the most extravagant. Comparisons of this nature, however, should be published as promptly as possible, otherwise they lose their interest. In order to make these exhibits, it is essential that careful account should be kept of the oil each employe receives. Upon some roads, tickets are used for this purpose, different tickets being provided for different kinds and quantities of oil. When a supply is furnished, a ticket representing the quantity is left with the storekeeper, and affords the basis for his charges. This plan works very well, but a better system, perhaps, is to provide printed slips upon which the different kinds of oil, tallow, waste and kindred appliances are printed in order. The quantity that an engineer, car-greaser or other person receives, is entered on this slip opposite the kind delivered him. The requirement that foremen shall approve requisitions for oil, will tend to prevent extravagance and wastefulness. As a rule, they know

better than the store-keeper the needs of the service, and if he performs his duty intelligently instead of perfunctorily, his inspection will prove highly beneficial. This approval is in many cases not possible (and perhaps not necessary) with engineers, but it is in all other instances. The slips just described for ordering oil are quite as adaptable for use at stations and elsewhere along the line of road, as for engineers and car-greasers.

The best manner for supplying stations and buildings with oil is an interesting question. It is the general practice to furnish cans for this purpose. These cans are sent backwards and forwards as it is necessary to replenish the supply. The loss this entails, both in the destruction of cans and the spilling of oil, is a considerable and constant source of expense. No feasible substitute for this method has, however, been generally adopted. One method suggested is to equip a car with the necessary tanks for supplying the oils required at stations, buildings and offices along a line and run this car over the road once a month, filling the receptacles at the different buildings directly from the car by the use of a flexible tube. There is nothing impracticable about the plan and it is probable it would prove economical. It would save the expense and annoyance of hauling the cans backwards and forwards, also the loss of oils spilled in transit, and the cost of keeping the cans in repair.

The storage of oil requires to be carefully looked after. No waste or combustible material should be stored in its proximity, and danger of every kind from fire should be carefully guarded against. The person in

charge of the oil supply, in common with others who handle supplies, should be subject to the immediate direction of the store-keeper; it should be his duty to fill lamps, lanterns, torches, etc., and attend personally to all disbursements.

The due and proper inspection of oils cannot be explained here, even if I fully understood the subject, which I do not. The duty requires thorough acquaintance with the nature of oils and the best methods of testing them. In some cases tests are conclusive, in others they are not. Thus the quality of kerosene may be determined accurately in this way, while valve, car, and engine oils must be submitted to the test of actual use in order to determine accurately their quality. The observation and experience of the men who use the oil is, therefore, systematically sought in order to determine accurately its worth, practical use being here, as in so many other cases, superior to theoretical demonstration or speculative knowledge.

A practical store-keeper writing upon the subject, says:

“Many things must be considered. Thus, the quality of lard oil must be determined by chemical analysis; it is only in this way that we can detect when it contains cotton seed oil or is made from the fat of hogs that have died of disease or from over-crowding; its burning quality depends upon its being made from the fat of healthy hogs killed for use; machine oils must be tested by actual use and analysis, the evidence of those who use them being necessary to determine their quality. Oils used by us, except car and engine oils, come in barrels.

Car and engine oils come in tank cars. Car oil is not to be distinguished from engine oil except by its fluidity, the color, weight, and appearance being the same. On receipt of kerosene oil, a sample is taken and tested in the following manner:—We heat the oil in an open cup over a spirit lamp, the bulb of the thermometer being submerged in the oil; after a space of about forty minutes a lighted taper is passed over the oil to ascertain the flashing point, and again afterwards, at a higher degree of temperature, to ascertain at what degree it will burn. If it ignites at a lower degree than it should, the shipment is returned; we consider kerosene good only when it will stand the fire test at 150 and 175 degrees. Seal oil must stand the test at 300 degrees. We draw our car and engine oil from the tank cars into large vats under the oil-house, and pump it from thence by stationary engines into tanks above, from which barrels and cans are filled for shipment to shops, store-houses, stations and elsewhere as needed. We manufacture our signal oil from lard oil and kerosene or mineral seal oil. I do not know that it is cheaper, but we are more fully assured of the quality when we make it ourselves. We have recently adopted the practice of manufacturing our own valve or cylinder oil; whether it is more economical to manufacture than to purchase I do not yet feel certain, but we are better assured of its quality; it is manufactured from tallow oil or lard oil with an equal amount of oil called cylinder stock. The latter is the last product of the retort in refining crude petroleum. Tallow oil and lard oil are the liquid product of crude tallow and leaf lard respectively, pressed at a cold temperature; valve oil is made by placing the two in a tank and thoroughly mixing and heating them to a certain degree of temperature by means of steam coils placed inside of the tank. In making signal oil for winter use lard oil and kerosene are used; in making it for summer use lard oil and mineral seal at 300 degrees test) are used."

CHAPTER IX.

SPECIAL REFERENCE TO THE MANUFACTURE AND
REPAIR OF ARTICLES.

It is probably no exaggeration to say that corporations cannot manufacture as cheaply as private parties. The latter are not more discerning in the selection of agents perhaps, but more exacting afterwards, more energetic, more economical, more quick to reward merit, more quick to punish incompetency. The spur of competition and self interest heightens the intelligence and intensifies the interest of the manufacturer. He is, moreover, especially careful in selecting the object of manufacture, and in keeping down cost. These facts are well known, and are the reason why railway companies prefer to buy from private parties whenever possible, rather than attempt the manufacture of goods themselves. There are, however, particular articles in common use that it is possible for a railroad company to manufacture as cheaply or even more cheaply than private parties. But the list is exceedingly small. Generally speaking, the only condition that justifies work of this kind, is where it is carried on as an accessory rather than as an object in itself. It continually happens in the operation of railroads that the services of a given number of men will be required in a shop for particular purposes, but these purposes are not sufficient, in themselves, to give them work all the time, and it results, if special work is not provided, that the force is more or

less unemployed, thus preventing a company from securing the class of workmen it needs or necessitating their payment for idle time. Under such circumstances the manufacture of articles may be carried on in a limited way to advantage, and while the cost may be greater than a company would have to pay in the market, still it will, as a whole, represent a saving. Except under such circumstances, a corporation is not justified in manufacturing articles when it can get the work done by others. There are, however, a large number of special, non-competitive articles that railway companies can manufacture as economically as private parties. This list embraces the articles peculiar to particular companies; the devices that are peculiar to their equipment and machinery; the patterns used by them that cannot be procured in the market quickly and under competitive circumstances. This list of articles is very great on every railroad. It has grown out of the continual changes and improvements that have been going on in railway appliances. Thus, nearly every locomotive requires a particular pattern for some portion of its machinery. In all other respects it may be of standard construction. Patterns of this nature can, all things considered, be repaired or replaced more quickly and advantageously by the company interested, at the time and place where needed, than in any other way. These patterns multiply with the development of railroads. The attention that must be given them and the provision that must be made for them in advance, constitutes almost a department in itself. The necessities of rail-

roads in this direction have had the effect to build up a more or less extensive manufacturing plant upon every road. In some cases work is rigidly restricted within the limits pointed out, namely, to the manufacture of articles peculiar to the company interested, that must be performed quickly and on the spot to prevent the plant lying idle, or that is carried on as accessory merely to other work. This is the true basis of railway manufacture. The pressure, however, to extend its scope is constant and growing. This tendency is the outgrowth of widely different causes. In the first place, the development of manufacturing necessitates the employment of a greater force and greater plant than would otherwise be required; this aggrandizes localities and increases the importance of those in charge. The pressure, therefore, to multiply the uses of a shop is constant and pressing. There is nothing inconsistent in this with good faith on the part of the officials and operatives of a company; they felicitate themselves on their increased sphere of usefulness and do not dream, in many cases, that it is at the expense of their employer. This is the result of ignorance. They do not know what the articles they manufacture cost; they know approximately, but not accurately. The methods of accounting in force upon railroads do not permit it. To determine this, accounts must take cognizance of every ounce of material used, whether new or old, and of every minute of time expended; also of all accessory items of cost, including transportation, superintendence, wear and tear of machinery, interest and kindred items. This involves an elaborate system

of accounts, not necessary or of especial importance when a company restricts its manufacture to those articles that it must repair or renew for reasons already given. Accurate information is, however, necessary in the manufacture of articles that may be bought in the common markets of the world. No one can afford to manufacture such articles without knowing whether he can do so as cheaply as they can be bought. This is the test. Railroads rarely if ever possess this information in regard to the articles they manufacture. Their system of accounting was not devised for such purpose and is not adapted to it. It takes no note of accessory or collateral items of cost. It takes every reasonable and necessary account of the disposition of material and the time of men, but its main purpose is to secure responsibility and prevent misappropriation or waste of material, and the prevention of time being allowed to employes in excess of that actually worked. It is, moreover, not particular as to the fractional part of a cent what it costs to manufacture or repair an article. It is not important. Not only is this so, but this inherent weakness is further aggravated by the disposition of workmen in many cases to reduce cost by fictitious means. There are many ways of accomplishing this, but the one commonly practiced is by using old material without accounting for it in the manufacture of new articles. No particular harm is done by such disposition if it is practiced only in connection with articles that a railway company must manufacture whether the cost is great or small. But when practiced under other circum-

stances it has the effect not only to deceive the owner, but to rob him; to encourage him in many cases to carry on a system of manufacture that involves constant loss while apparently benefiting him. It is very difficult to prevent undercharges of this character, for they are thought to be perfectly harmless by those who practice them. Yet the habit must be totally uprooted wherever a company enters generally into the manufacture of articles. No company, however, should be permitted to do this. It may, perhaps, do so profitably under particular men or conditions for a time, but the practice must ultimately result to its disadvantage. The safe way is the best way, and that requires that every company shall restrict its manufactures to those articles peculiar to it, or that it carries on as accessory merely to other work.

The list of articles necessary for a railway company to manufacture, or that it may manufacture with advantage, is dependent upon the extent of its property. But it is great in any event. If locomotives and cars were uniform, it would not be necessary for a company to manufacture a single article. Its efforts would be confined wholly to repairs. But lack of uniformity compels it to provide facilities for repairing and manufacturing articles that are peculiar to it, without delay and where needed, or keep a duplicate of each article of this nature constantly in stock to prevent machinery lying idle while the article wanted is being procured. This duplication is impracticable. Repair shops must, therefore, be located along the line of a company so as to be quickly and

easily accessible and where breaks may be repaired and simple articles renewed when necessary. These repair shops must be available for repairing locomotives, cars, track tools and other appliances. They must be general in their use. And herein again lies a difficulty. In corporate affairs it is the disposition of every department to seek to provide especially for its particular wants rather than combine with other departments for the common good. This tendency upon railroads, if unrestrained, would evince itself in the machinery department by a repair shop for locomotives, another for cars, another for track implements, and so on. One, however, is sufficient for all, except in the case of the general or construction shops of a company. By restricting the number of shops and enlarging their usefulness, greater economy of labor and efficiency of service is secured than is possible otherwise. An objection to this plan is that the work of particular departments is not attended to according to the emergency of the case as promptly as if carried on by a subordinate of such department. This criticism, however, is not tenable. The trouble does not lie in concentration, but in the lack of interest on the part of the person in charge. The remedy is in disciplining the delinquent employe, not in duplicating him.

The repair shops along a road, when systematically regulated, are graduated in importance from the petty shed with a blacksmith's bellows and forge up to the great central shop where all repairs and renewals, so far as the convenient and economical working of the system will permit, is carried on. The small shops in their order

are the ladders that lead those in charge to duties of greater importance and serve to teach them and stimulate their ambition. The necessity of harmony and subordination is imperative. Each shop should be held subordinate to the one immediately above it and wholly so to the general repair shop, where all new work and all general repairs should be done, so far as possible. Without constant watchfulness, the tendency, however, of each shop will be to make its usefulness general and to strive to grow from a fragment or accessory into a system.

The details connected with the manufacture and repair of articles do not need extended notice here. To attempt to describe them or to provide a system of accounting that would enable a company to know exactly the cost in each instance, would require great space and infinite elaboration, and would prove, if enforced, both unnecessary and excessively costly. A great deal of thought has been given to the subject of ascertaining cost by manufacturers. No one appreciates so fully as they the necessity of knowing exactly what a thing costs in order that a price may be put upon it; in their efforts to do this, every device that the ingenuity or experience of men could suggest has been adopted. These devices may be carefully studied by shop-clerks, and whenever there is an attempt upon the part of a company to do more than manufacture and repair articles peculiar to it or necessary to its convenient and economical working, the devices for ascertaining cost must be thorough and effective and must be rigidly enforced by store keepers.

Those in charge of shops and shop accounts owe it to their employers to prevent any concealment of the cost of articles manufactured or repaired. Wherever work of this kind is carried on every opportunity should be taken to make the cost known to those responsible for the general management of the property. This duty is not discretionary, it is imperative.

In the manufacture of articles, more or less material is unavoidably rendered worthless. When this is the case, the fact should not be concealed by placing the article in store, but such disposition made as the facts require. The practice of the English roads in regard to neglect of duty or awkwardness upon the part of operatives is much more marked than in America, as reference to their rules and regulations show. Thus:

“Any workman making any article of wrong dimensions, or finishing work in an inferior or unworkmanlike manner, must make good such work, and pay any extra expense that may be incurred, he being allowed the value of old material for such work spoiled. Any workman injuring a machine, or other article, through carelessness or neglect, shall pay the amount of the damage, and be fined two shillings and six pence. Any workman knowingly making use of materials which are imperfect or otherwise unfit for the intended purpose, to pay all expenses incurred thereon, after the discovery of the defect.”

In order to simplify accounting and save clerical expenses and unnecessary repetition, every article or group of articles manufactured, should be given a designating number, and charges made accordingly.

“Every workman should give in his time, with the name or number of the article or job he has been working at during the day. The time to be given every day to the clerk appointed to receive it.”*

The name of the article or group of articles thus manufactured, should be kept on the record book of manufactured material in the office of the store-keeper. As soon as the work in progress is completed, immediate measures should be taken to ascertain the average cost, (if there is more than one article), and comparison made, so far as possible, with the price of similar articles. If the cost is excessive, or is thought to be so, the material used should be carefully scanned and the list of men engaged in the work compiled with their several allotments and each man interrogated, if necessary. These interrogations may not serve any useful purpose at the time, but they will have the effect to suggest and enforce greater economy in subsequent work in the event there has been extravagance. The value of constant supervision and reminder of this kind to a company is incalculable. Its purpose is to prevent extravagance and sloth, and it serves to bring to the notice of a management, those who are efficient or otherwise. Private manufacturers discover these things intuitively. Great corporations discover them more often than otherwise through the mechanical processes that exhibit results. These processes consequently are of especial value to railroads and should be so regulated as to afford accurate data,

* “Any person neglecting to do so accurately, will be fined one shilling.”—
(*Extract from Rules of English Companies.*)

otherwise experience, capacity and faithful service in subordinates will oftentimes remain unknown and therefore unrecognized.

CHAPTER X.

BRASSES: THE SPECIAL RISKS ATTENDING CARE OF SAME. NECESSARY REGULATIONS.

The relatively great value of brass and the general market that exists for it, makes its protection exceedingly difficult. When shipped from one point to another, it must be carefully sealed in cars or securely locked in boxes. When in store it must be protected within secure walls. The danger of loss is constant and imminent, not from employes, but from others. However, in a great organization like a railway company, where men are constantly coming and going, it is unavoidable that men should sometimes creep into the service temporarily who are not to be trusted. These have to be guarded against. Various methods have been introduced from time to time for the purpose of preventing the loss of brasses, babbitt-metal and similar material. They are at once varied and ingenious. That, however, which requires that the broken or worn out article shall be returned before a new supply is issued, seems to be altogether the most simple and effective. It makes every one more particular. Thus, when an accident occurs, the person in charge is careful to collect every article that has to be replaced by a new one. Without

it he might experience some trouble in replenishing his stock. Its possession is necessary to facilitate exchange. Except for this the article might, in the hurry and confusion, be lost. The rule of exchange is a constant reminder to engineers, car-repairers, and others, that in order to replenish their stock they must be careful to preserve worn out or broken articles. Exchanges of this kind are constantly going on, old brasses and similar articles being taken up by store keepers and new ones issued in their places. The system simplifies accounting. An account is opened with each engineer, repairer or person to whom brasses are given, charging him with the number of each particular pattern. When the brasses thus charged are returned worn out or broken, new ones are given in exchange. The original charge is not disturbed. If, however, the person leaves the service, the account is closed. In the event the supply in the possession of an employe is lost or diminished in any way, the books are readjusted to conform thereto. In cases of this kind the English companies are very strict; if no satisfactory account can be given of the missing articles, the workman is held responsible therefor, the value of the missing supplies being deducted from his wages. This arrangement is perfectly equitable and cannot prove a hardship to anyone while its enforcement will have the effect to prevent irregularities.

The supply of brasses in the hands of workmen should be inventoried monthly, or when those having them in charge leave the service. It is impossible to prevent the occasional unavoidable loss of a brass, but

the circumstances that attend the loss are always susceptible of explanation at the time. The interests of the service require that this explanation should be forthcoming in every instance.

In addition to the regular orders for brasses and kindred articles to replace those worn out or broken, there will be a constant demand for such supplies to form new stock, original orders in fact. When this is so, there is, of course, no old material to give up in exchange. The store-keeper must in such instances satisfy himself that the order is necessary and equitable before filling it. If the issue is for construction purposes, or for immediate use, a charge should be made in accordance with the facts. If it is to be held in reserve for use as required, it should be charged in the usual way to the person thus holding it.

The number of brass castings that a great railway company manufactures is much larger than would be commonly supposed. My attention has been called to one instance where seventy different patterns of this description were manufactured at a particular shop. The care of these patterns and the protection of the material both before and after manufacture necessitates the most ample provision. Wherever possible, a separate room or compartment should be provided for brasses. When the amount does not justify this, then a secure cupboard or other enclosure should be provided. It should be remembered, moreover, in this connection, that it is often more necessary to protect the raw material or scrap, than the manufactured article; the latter, it is quite likely, has

some mark or stamp upon it by which it may be identified, not possessed by the former; the care exercised must be incessant and intelligent. In distributing brasses, the rule observed in the care of other material, that the supply shall not exceed the absolute necessities of the case, must be rigidly enforced. In this connection it may be proper to refer to a subject that affects the brass account, in common with other accounts. The matter I refer to is the necessity of exercising the utmost care in inspecting the cars of other lines used by a company at the time of their receipt, in order to avoid any losses that may attend the renewal of brasses or other appurtenances belonging thereto. In concluding what I have to say here in regard to the brasses of a company, I do not know that I can do better than summarize certain regulations governing their use, namely:— The blank used in ordering should have printed thereon the different classes used, the number required being inserted opposite; special care must be exercised in ordering, storing, distributing, and guarding afterwards; for each and every article issued, an old or worn out one must be returned; when this is not forthcoming, the reason therefor must be properly explained; if the employe is in fault, the rule of the English companies, that he shall pay the value of the missing article, should be enforced; orders for brasses should specify the purpose for which they are to be used; in the event they are used for purposes other than that specified, immediate notice of the fact must be given to the store-keeper.

The losses that attend the use of brasses suggest others entirely different. I refer to the use that employes of corporations make of the stationery of their employers. The universality of this practice excuses and justifies it. It has its counter-balancing considerations. The practice is much more common with the employes of private individuals than with those of corporations. Everywhere the use of the paper, envelopes and stationery of employers is recognized as a perquisite or right of employes. Abstractedly considered, the practice is perhaps wrong. As a matter of fact, the employer does not suffer at all, or except in the most minute sense. The use of his stationery advertises him while it perhaps assists those under him to eke out a slender income. So long as it is restricted within the limits named, no harm is done. In all other departments, however, the property of employers is, and should be, scrupulously regarded. When it is not, the act is regarded as indefensible. This is always the case in reference to the appropriation of property for purposes of personal gain. The selling of a thing that belongs to another, however trifling, is considered wrong, even by those not so scrupulous in other matters. The benefits that are derived by employes from the recognized concessions and courtesies of employers, are much more general and valuable than is commonly supposed. They are none the less great or valuable because the employer does not always suffer thereby. Thus the passes that railway companies give to their employes and to their families are of enormous value to the latter, while the loss to the company is very small, if they suffer any loss at all.

In the majority of cases those who use these passes would not travel without them and in other cases the employer recoups himself partially or wholly in other directions, in the increased loyalty and interest of his servants and in their ability and disposition to work for less wages. The list of benefits, special and mutual, might be greatly extended. It is, however, unnecessary. I refer to the subject at all, simply to illustrate the beneficent relations that exist between employer and employe and the disposition of the former to aid the latter in every way he can.

CHAPTER XI.

SPECIAL REFERENCE TO OLD MATERIAL.

There are two classes of old material; that which has no value except to the junk dealer, commonly known as scrap, and that which may, with slight repairs, and in many cases without repair, be used again. Through ignorance and in the hurry of business and on account of the unavoidable lack of responsibility that must ever characterize a large force, more or less usable material finds its way to the scrap heap. In order to prevent this being sold at a nominal price, all old material should be carefully assorted by a competent person. This process requires adequate provision in advance. The examination should be made, first at the place where the scrap is collected and afterwards at the central depot where it is sent for final dis-

position. This inspection will serve the double purpose of preventing material being sold that may be used further and as a reminder to employes of the necessity of exercising care *

It is probable there is as little waste proportionately, on a railroad as elsewhere, but there will always be instances of neglect. It does not matter whether the neglect arises from ignorance, thoughtlessness or indifference, the monetary loss is the same. Instances of neglect, while not common, are of continual occurrence. Thus, the employes of trains may abandon or throw on to the scrap heap switch chains, frogs, or other implements that might with slight repairs be used again; while in the machinery department, injectors, cylinders, cocks and similar implements that might be used again, will be thrown aside as worthless. Occurrences of this nature are constant and unavoidable, and in order to prevent the losses they would entail, it is necessary that old material should be constantly inspected by men capable of determining that which is usable from that which is not; men, moreover, who will call the attention of responsible officials to evidences of persistent neglect or improper practice. After the usable material has been separated from the other, the latter must be again assorted according to its value. This is very important. Iron, steel and brass, for instance, must be kept separate and sub classified according to value. To mix the different kinds and classes is to greatly lessen their value.

*"Any person putting material upon the scrap heap which is otherwise valuable, or carelessly wasting material in any other way, will be punished as the case may deserve."—*Extract from Rules of English Road.*

The promptness and thoroughness with which old material is collected and stored is an evidence of efficiency. Neglect not only breeds demoralization, but it engenders direct losses from misappropriation and deterioration. It is frequently excusable, because of the urgency of other duties. It is a question of relative values. For a busy man to leave his work or go out of his way to collect old material of less value that is in no immediate danger of misappropriation, is not economy. But if demoralization and loss may be avoided by placing convenient and secure receptacles for this old material about the various buildings and along the track of a railroad, where it may be deposited by men otherwise occupied, then undoubtedly, neglect to do so is inexcusable. The work of removing the material from such receptacles is not important. It may be carried on at such time and in such manner as to secure needed results at the lowest cost. Wherever provision of this nature is neglected the loss of old material will be constant and distressing; it will be covered up with cinders, dirt, weeds, brush and grass, hidden away behind buildings and under platforms and stairways, or stolen by the wandering urchins that lurk about every railroad yard. It is doubtless true that the scrap that accumulates about a particular station, office or building is small and seems hardly to merit attention; it possesses, however, in the aggregate, an enormous value and its preservation merits the same provision and care that railways devote to other matters.

The bulk of the old material of a company accumulates about the shops and along the track. The diffi-

culty of collecting the former is not great, as it is restricted to narrow limits, and is, moreover, under the immediate eye of a store-keeper whose business it is to look after such matters. The disposition of old track material is more difficult and the liability to loss much greater. This particular phase of the subject has, however, been already referred to quite fully in the chapter on track supplies. The following letter, however, in reference to it, from an experienced and watchful superintendent, is worthy of insertion here:

“Each section foreman should have a platform for storing scrap picked up along the road during the day. Every tidy and painstaking foreman will carefully pick up every piece of scrap and put it on the pile at his tool-house. Any article too large to be placed on his car, he will remove on his dump car, or else have a way freight train stop long enough to permit him to load it. In this way the scattered scrap, representing thousands of dollars annually, will be taken care of and saved from loss. About the middle of the month each roadmaster should start a car on some way-freight train for the purpose of gathering up scrap at section foremen’s houses and at depots, and ship it to some central point where it may be assorted and such articles as are fit for further use separated from the others; the latter being sent away, while the former is redistributed for use.” *

In the breaking up of buildings and other structures, the material that is susceptible of further use (the usable “scrap” of all kinds) should be carefully picked out and placed with supplies of a like nature. The

* “Each foreman should be responsible for collecting any coupling chains, hooks, pins, iron, or other material which may be found on the line, and for having them conveyed to the nearest station weekly.”—*Extract from Rules of English Road.*

process in such cases is not more difficult than with ordinary scrap (indeed, not nearly so difficult), but in order to secure accurate accounting, the old building material thus collected must be brought on to the books and again charged when subsequently used. The method of accounting should be the same as in the case of common scrap, and the same care should be exercised to separate the usable material from the other. Another class of old material may be noticed, namely, the papers and books that accumulate about the stations and offices of a company; they are, in the aggregate, of considerable value, sufficient at least to make them worthy of careful attention. The separation of the papers and books that it is desirable for a company to retain from those which it may sell requires to be conducted with the greatest care. This is necessary in order to prevent the sale of books and papers required to protect a company against any suit or charge that may be brought against it. The work must, it is manifest, be conducted by those experienced in such matters, and able to distinguish at a glance that which may be safely sold from that which must be kept. The assortment of papers must, in the majority of cases, be made at the place where they have accumulated. No rule can be laid down in matters of this kind, except, perhaps, in reference to the accumulation of traffic papers and books at stations. The great bulk of the papers at the headquarters of a company must be kept, practically, forever. They may not, indeed, be necessary to protect the company, but no one can tell when they may be neces-

sary to protect the good name of some of its officers or employes. But in regard to accumulations at stations and local offices, a good rule to observe is, that no books or papers shall be sold or disposed of except under the direction of the authorized officers and inspectors of the company. Traffic accounts should be retained at stations until the expiration of the period of limitation fixed by statute. This period varies in different states, and in order to cover inter-state business, the records must be retained during the longest period of time which the statute of limitation covers in any particular state. After that, no claim against the carrier for loss, damage, overcharge, or other purpose, as represented on the station records, can be prosecuted; the records may, consequently, be safely disposed of. It should be the duty of the inspectors or traveling auditors of a company, when visiting stations where material of this kind has accumulated, to personally superintend the way-billing and shipment of the same to the general store-keeper, to be by him sold or otherwise disposed of under the direction of the proper officer. Waste paper accumulating about stations and offices should be preserved and shipped with records as stated above; or if it is inconvenient to retain it until such time, it may be shipped separately.

Whenever practicable, stalls or bins should be constructed at shops and store-houses for different classes of old material or scrap. These receptacles should be convenient for collecting, watching and shipping. The daily additions made to these stores should, so far as possible,

be carefully entered on the record book of old material, which should be kept wherever material of this kind accumulates. In this way the amount may be noted in detail and the source from whence it is derived, ascertained and proper credit given. The record book in question should also contain full particulars of all old material shipped.

No old material should be sold, except under the direction of an authorized general officer. The necessity of limiting this power is manifest. Such sales are commercial transactions and should be governed by the markets of the country and with due reference to transporting from one point to another, including cost of handling. If sold under such conditions, material will be disposed of in the town or city where it accumulates if it can be sold there to the best advantage, otherwise not. The seller must possess a general knowledge of markets in order to avail himself of the highest. Where he does not possess this knowledge, advantage is taken of his ignorance.

In regard to the shipment of scrap it will frequently occur that it will not be convenient for a particular store-house or division to await the collection of a car-load of old material. To prevent cars being partially loaded, the accumulations of several depots should be grouped together, if possible, under such circumstances. The rule should be to invoice the old material to some designated local store-keeper; he will take it up on his books and add to the scrap that has accumulated about his own store-house. When there are no facilities for accurately

weighing old material thus transferred, the weight may be estimated (as in other cases) and credit given on the basis of such estimate. This method of forwarding old material should apply only in cases of partial car-loads and is designed to avoid the added cost of shipping small lots, when by bulking the accumulations of two or more store-houses, full car-loads may be secured. In the collection and shipment of old material it should be invoiced directly to its final destination, there to be re-weighed and correct returns made to the shipper.

In order that due advice may be had of old material, monthly returns should be made of the quantity on hand, amount disposed of, how disposed of, and such other particulars as the official in charge may require. When shipped, old material should be way-billed by the station agent as in other cases. If possible, it should be accurately weighed before shipment as a check upon the receiver. It should, however, be re-weighed by the latter and the invoice corrected according to his weight. In transferring old material from one store house to another, the practice enforced in other cases should be observed, namely:—the person shipping, should receive credit, while the recipient should be charged. When shipment is made directly to a rolling mill, or purchaser, without weighing, the agent of the company at such place, or intermediate thereto, should be required to weigh the same accurately and certify the weight to the store-keeper making the shipment, also to an officer of the company. At the close of each month, moreover, this agent should make a report to such officer of all cars thus

delivered during the month, specifying the date, number of car, amount of scrap, weight, and such other particulars as may be necessary to enable the company to keep accurate and full account with the rolling mill or person to whom the scrap has been consigned or sold. The obvious necessity of these precautions is apparent.

Another thing that may be properly noticed in connection with old material is the disposition to be made of it on the books. The proper account to charge it to is "Material on Hand;" it should be credited to the thing from which derived. Thus, if it is part of a building that has been broken up, it should be credited to that building or to the account to which the building was charged. Old material coming from the track, bridges, buildings, locomotives, cars or fences, should be credited to these respective accounts. Unfortunately, however, a large proportion of the old material cannot be identified. So far, however, as reasonable diligence and ingenuity will accomplish this, they should be exercised. But there will be innumerable cases where this cannot be done, and the origin of the material can only be surmised. This will be so in regard to the filings, drillings and borings that accumulate about a shop. These it is impossible to credit to the account to which they belong. It has been suggested that a good way to dispose of such material is to credit it to a general account, and apportion it afterwards to the different maintenance accounts (with which the shop in question keeps account) on the basis that the amount expended on such accounts bears to the total amount of material expended. Thus (if it is a

locomotive shop) the credits would be apportioned to the various locomotives according to the total amount charged to them during the month. The same should be done in regard to cars and machinery, or if it is a shop where all kinds of work is done, the apportionment must be general, to the extent that the work has been general. Whenever the amount of old material such as we have described justifies, a division may be made on the basis of particular classes of material. Thus, credits for old cast iron would be based on the amount of charges for cast iron; credits for old car wheels would be based on the new wheels used; old wrought iron would be based on the wrought iron charged, and so on. By simple devices of this kind, each store-keeper will, according to his intelligence and interest and the necessity that exists for their display, be able to arrive at an accurate disposition of the credits that arise at his store-house for old material. In order to facilitate the effort to ascertain the account to which old material is creditable, the practice should be to turn it over to the store-keeper as fast as it accumulates. This will insure disposition of the matter while the facts are still known and will also prevent loss or improper use of the material.

The great value of old material and the indifference that men are liable to fall into regarding it, requires that there should be a general rule upon every road.

First, that it should be collected daily, except in case of rails.

Second, that it should be assorted forthwith with a view to determining that which is usable from that which is not.

Third, that it should be classified according to demand and value.

Fourth, that it should be carefully protected.

Fifth, that it should be forwarded to a central depot when the amount collected justifies, at a particular time determined upon.

Sixth, that it should be re-assorted, re-classified and re-weighed at the central depot and careful measures taken to protect it against loss or deterioration until such time as the company sees fit to sell or use it.

Seventh, that it should be sold by persons familiar with the general markets for this kind of material.

CHAPTER XII.

SPECIAL REFERENCE TO TOOLS.

It is probable that every company loses more or less tools. They are coveted by some on account of the price they will bring, by others simply for possession. The latter is the predominating cause of loss. Indeed, the number of those who purloin for purpose of sale is so small as hardly to merit attention. But tools of common use, such as saws, hammers, files, hatchets and lamps, are so convenient about a house that they offer constant temptation to the unthinking. In the estimation of such, acquisition without purchase makes the article doubly valuable. To buy would be a hardship, would serve to keep the person poor, would be an extravagance in fact; but to secure without sacrifice doubly enhances the satisfaction of ownership. Many articles

of shelf hardware disappear in the same way, and for the same reasons. There is something very attractive about new tools and shining hardware to a mechanical man. They possess to him a glossy, cheerful look, and suggest so many uses that the sight of them instantly creates a desire to possess. They are to him what a piano, or clock, or vase, is to a town lady, or an assortment of choice household utensils is to her rural sister. But what is singular about it is that the taker does not, as a rule, associate the idea of stealing or wrong-doing with the act. The sense of personality or ownership surrounding the article is so indefinite as not to be considered at all; indeed, the distinction between owner and employe is quickly lost sight of by many who work for corporations. The process is natural and does not imply dishonesty on the part of its possessor. The spades, axes and shovels that lie scattered here and there about a railroad seem to have no owner; seem to be quite as much the property of one man as another, except that they have a much less relative value to the owner than to many who work for him. What more natural, then, than that the beautiful and shining implements, so useful to a thrifty householder, should sometimes be borrowed by him as he feels their need, or that their return should be overlooked and finally forgotten. I do not mean to intimate that practices of this kind are at all general. On the contrary they are exceptional, and the great majority of the people who indulge in them (small as the number is) would be horror stricken at the thought of committing a crime; the act is not

criminal except when committed by criminals; it is an act of thoughtlessness, that is all, the natural outgrowth of the neglect of the owner to properly guard his property: it is, however, none the less to be discouraged: the losses it engenders, while they do not seem to affect anybody, really affect the fortunes of individual people, as bona fide as the employe himself.

The acts of the few necessitate rules and regulations binding upon all; and while these serve to hold in check the vicious and the thoughtless, they stimulate all others to exercise greater care in the protection and use of the property entrusted to them.

When proper safeguards are not thrown around the use of tools, more or less will be lost through negligence. Many tools that with a little repair might be made serviceable, will find their way to the general scrap heap. Improvidence will also characterize the use of them. I have heard it stated (whether truthfully or not, I do not know) that the wear and tear of a company's tools in the hands of mechanics amounted to fifty per cent. per annum, while in those cases where the tools were owned by the operatives themselves, it was not over twenty-five per cent.* The propensity to use property belonging to others improperly or roughly, requires always to be guarded against. The tools furnished for use should never in any case exceed those absolutely necessary,

* On the other hand, as a set-off against this apparent loss to a company, it is stated that where employes use their own tools the result is not satisfactory. To use the words of my informant, "there is a question as to the advisability of employes using their own tools; they will work with them just as long as possible, and the consequence is they will not do good work, and will take too much time for that which they do." M. M. K.

lest due diligence may not be exercised in caring for the surplus. The tendency to order more than is needed, and neglect to return that which is not needed or that is worn out, will depend upon the wisdom of a company's regulations and the rigor with which they are enforced. It is very easy to build up in employes a disposition to exercise economy; it is still more easy to build up extravagant habits. The trouble is not with the employe so much as in the method of government. The frequent changes of those above him bring with them corresponding changes in methods. Thus, while one official will enforce the most careful economy in the use of tools, another will not give the matter any consideration at all. The rules and regulations should be uniform and consistent, such as not to injuriously affect anyone honestly desirous of fulfilling his obligations, but sufficiently strict to reach the thoughtless, the improvident and vicious, taking hold of the latter with iron hand and compelling them to look after the property placed in their trust with the same regard that attends the practices of private individuals. The English railroads are very strict in this respect and much more methodical in their measures of government than we are. Some of their regulations will be found embodied further on in this chapter. Many of them sound very queerly to us; they have a smack of frankness and good sense about them that is refreshing to Americans, who durst not for their lives call anything by its old fashioned Saxon name, if it refers in any way to the voter; more especially those voters who, in our

lofty sentimentalism, we agree in designating by the euphonious title of "wage-workers."* If, however, the wage-worker be a man who has accumulated a little money, or a few shares of bank or railroad stock, or has achieved reputation or position through his industry, intelligence and saving habits, the case is different. In such event it is fashionable to blackguard him, to call him a fraud, thief, monopolist, gold bug, Wall Street speculator, a grinder of the faces of the poor, and so on. If we want a vote, this will often help us to get it. And none of us know when we may want to run for office! We all of us have a weather eye for offices, and consequently a soft side for the voter! We are very tender of him in the aggregate, very neglectful of him in his individual capacity, especially when by stamping upon him we may acquire renown with the multitude!

In the disposition of tools, an account should be opened with each employe, charging him with those he receives and crediting him with those he returns or otherwise accounts for. No tool should be given out, except in exchange for a similar one; when tools are given out for the purpose of creating a new stock, or are for some special purpose, an order duly signed and approved should be filed, stating the use to be made of the supply, etc. No new tool or utensil should be given to replace another without the return of the old one. This rule is

* When I worked upon a farm, I performed the work of a *Laborer*, was called a *Laborer*, was a *Laborer*. Since then, however, the word has apparently become offensive, as we no longer hear it. Under similar circumstances I should doubtless now be called an "Industrial Agent," "Soil Cultivator," or "Wageworker."

so simple that anyone may understand it, and so comprehensive that its observance may be depended upon to protect the company practicing it. Of course there will be exceptions to its rigid observance. Articles will be lost in wrecks, will be stolen without anybody being to blame and will be burned up or otherwise lost. In such cases, it is manifestly unjust to compel the employe to pay for them. Exception should, therefore, be made after due enquiry, and when made, the charge upon the books against the employe should be canceled. The utmost frankness should, however, be observed in scrutinizing reported losses and in looking after tools in the hands of employes.

No specific rule can be laid down for caring for tools in the hands of workmen. It must be such as the circumstances of the case require. Thus, rules that will protect the implements used by mechanics about a shop, would not answer in regard to those used by train, station, and road men. Where a store-house is in immediate proximity to a shop, it should be made the receptacle for storing tools at nights and when not in use. In other cases special provision must be made, but it should be of the same general nature. The more simple and economical the device for keeping a record of the tools in the hands of employes, if it accomplishes the purpose, the better. It has no value except for the moment. It does not, therefore, necessitate or invite elaborate book-keeping. At shops, a room may be set apart for storing the tools, a compartment or pigeon hole therein being assigned to each workman; when the tools are dis-

tributed originally to the men, a receipt should be taken therefor; on the return of the tools at night, this receipt should be given up; when the tools are required in the morning, the receipt should be delivered again to the store-keeper and placed in his compartment in lieu of the articles. In the event a tool is not returned at night, the reason therefor should be ascertained. This method is at once simple and thorough, and should be followed whenever circumstances will permit. When tools are delivered for use away from the store-house a receipt should be taken and a special charge made against the employe receiving them, as already described; a duplicate of the receipt taken should be retained by the employe, so that he may have a record of the article charged against him. A very good way to treat such accounts is that observed by banks with their bills receivable account. Thus, when a charge is made, the credit line opposite is not used until required to offset the particular debit entered on such line. Thus, the number of blank lines on the credit side shows the number of bills still unpaid. This system can be used in regard to tools, the number of blank lines opposite the charges would represent tools outstanding in the hands of workmen, and a casual glance would be all that would be required by the store-keeper to inform him fully as to the status of every account.*

All tools and devices of a company, should, as far as possible, be stamped with its name. Tools in the hands

* I think, however, the form of return described in connection with the distribution and use of station and train supplies (in the chapter on the "Distribution of Material,") superior to this method. M. M. K.

of workmen should also bear their private mark. In order that due responsibility may be enforced on the various divisions or lines of a road, a record of tools used on each division or line should be kept by a particular store-keeper, to whom all other store-keepers should report. In this way, if a trainman procures tools at different store-houses, the charges therefor will be summed up by the general store-keeper and the recipient held to a due responsibility for the aggregate amount of tools he receives. To enable this to be done, each store-keeper will report to the central store-keeper as often as once a week the tools delivered to each employe. When an old tool is returned by one of these employes, the fact should also be reported to the central store-keeper, so that credit may be given; if, however, a new tool is exchanged for the old one returned, no report need be made of the transaction, the purpose being simply to maintain a correct record of the number of tools in the hands of each employe. It should be understood, however, that no report of tools disbursed need be reported to the central store-keeper except when such tools are delivered to train men or other employes who can procure tools at two or more store-houses. When an employe is compelled to order all his tools from a particular store-keeper, that store-keeper will in such case be able to exercise the supervision over him that the central store-keeper does in other cases.

Not only should old tools be returned before new ones are issued, but the rule should also apply to such articles as paint brushes, brooms, lanterns, feather

dusters, pails, switch chains, jack screws, wheelbarrows and crowbars. It should apply to every article, which when worn out or rendered useless may be returned as evidence that the article has not been misappropriated or lost through neglect or otherwise. This comprises an enormous number of articles of scant value, and a record of them will appear, superficially, to be not only unnecessary but extravagant. This view of the question, however, looks only to the act and not to the effect, considers only the value of a particular article (which is not great), rather than the aggregate value, which is enormous.

Orders for tools (except in the case of old tools to be exchanged for new ones) should be approved by an official conversant with the needs of the person making the order. This duty requires wide experience, firmness and tact upon the part of the person enforcing it. When tools cannot be delivered up each night to the storekeeper as already described, boxes with secure locks should be furnished in which to keep them; the rule being to place it within the power of every employe to protect the property entrusted to him, so that if loss occurs, the presumption will be that it is through his neglect. An inventory should be taken of all tools in the hands of employes at frequent intervals, at least monthly. When an employe leaves the service, or has no further use for the tools in his possession, they should be delivered up or accounted for before satisfaction is rendered for wages due. The taking of an inventory of tools in the hands of employes will serve among other things to discover any in their possession not needed and that are likely

therefore to be lost or suffer deterioration. In the event that no account of tools found in his hands should exist, it will demonstrate lack of efficiency in distributing, or if the tools belong to other workmen, the neglect of the latter to care for the property entrusted to them. Frequent inspection will serve to emphasize the necessity of careful guardianship and to discover its neglect wherever it exists.

In reference to tools used by train men, the following extract from the letter of a practical store-keeper is interesting :—

“Tools used on locomotives should be issued by store-keepers to engine-men, only on an order from the foreman of the round-house,* and, as far as practicable, engine-men should get all their supplies and tools from one place. For example, an engineer running between Boston and Albany should procure what tools he needs from the Boston shop, only getting at Albany shop things that he might have occasion to use on his trip to Boston. The master mechanic can, to a great extent, regulate the furnishing of tools to engine-men by instructing them where they must procure their tools when on certain runs, and by giving foremen at different shops where supplies are issued, instructions as to what runs they shall supply. In this manner the different foremen can keep very well posted in regard to number or quantity used, and would know if an engine-man were careless in the keeping and handling of his tools.† Engineers, as a rule, I think, are careful with the tools they carry on their engines, from the fact that they like to feel sure when they start out on a trip that they are not going to

*Unless they are in exchange for old tools.

†If the rule required that all tools disbursed should be reported to a central shop, this requirement would be much more easily enforced than in the manner stated here.

run short of anything, and as they do not like the trouble of going over their stock at the commencement of each trip, they keep their tools under lock and key.

“Orders for tools for use on trains should be made on the store-keeper by the conductor, but should not be filled by the store-keeper unless approved by the superintendent of the division or some one he may authorize.* Trainmen, as a rule are, I think, inclined to be careless with the tools furnished them, if all that is necessary to obtain new ones is for them to make an order on the store-keeper. But if the order must bear the scrutiny of the superintendent, they will incline to be more careful. I also think that the store-keeper should be empowered to refuse to fill an order, even if approved by the superintendent, if he sees, or thinks he sees, anything out of the way in the order. For instance, if he should know that the conductor had recently had a number of the same tools for which an order called, and thought that the same had escaped the notice of the superintendent, the conductor could then take the matter back to the superintendent. The store-keeper could give his reasons why he thought the orders should not be filled, and the superintendent could render a decision as to whether the store-keeper was right or not. As a rule, however, an approved order that a store-keeper would not fill would never be taken back to the superintendent by the conductor. Tools on trains, unless carefully looked after and guarded by the crew, are very liable to disappear, and the most effective way to make a crew take care of their tools is to hold them responsible for their outfit.”

The distribution of tools is more or less complicated under the most favorable circumstances. No two will agree, it is very likely, as to the best method. The plan

*Except in the case of the exchange of new tools for old.

already outlined, however, will prove not only to be reasonably efficient, but economical. A railroad man, interested in this subject, writes me as follows :—

“ I think a new system ought to be instituted for the delivery of tools and supplies. I would supply each engine, way car, coach, section foreman, in fact, every person and everything, with a complete outfit. Every article to be stamped with the name, as ‘ Coach No. 95,’ ‘ Engine No. 236,’ ‘ Section No. 5,’ and so on. I would make the person immediately in charge responsible, and when a new article is wanted, let him understand that the old one must be returned or a satisfactory explanation given. Every day, lanterns, wrenches and hammers are lost or stolen, or some mishap of a like nature befalls, which would not, as a rule, happen to a person's own property. To start such a system would cause great trouble and annoyance, but when once established would more than pay for itself in the saving effected. Fifty per cent. of the houses in this town have lanterns that belong to the railroad company, which have no right there, and no doubt numerous articles which could not be identified have found their way to many houses in the same manner.”

The enforcement of the rule requiring the return of an old article before issuing a new one will prevent the depredations he refers to. He exaggerates the difficulty experienced in adopting this system. All it requires is that an inventory shall be taken of the tools in the hands of each employe, and that the same shall be specifically charged to him. At shops, tools in use should be delivered at the close of each day to the store-keeper as already described. At other places, where this cannot be done, some person designated by the store-keeper

should have charge of the tools, and it should be his duty each night to see that they are duly counted, and in the event any are missing, to notify the proper official. This rule should be enforced, not only in regard to what are commonly known as tools, but as already suggested in reference to other implements.

When tools are shipped, a receipt should be exacted in each instance, so that the sender may be sure that the property has been received. In sending tools back and forth on a line for repairs, no formality is necessary further than to ensure their reaching their destination quickly. Many ingenious devices have been adopted to secure this. Sometimes the property is way-billed, in others checked like baggage, or a tag is attached. It depends on the nature of the material somewhat. A good plan, when the property is an isolated article, and is shipped by baggage car, is to attach a metal check with the address of both sender and receiver, so that the same token may be used in both directions. More or less care has to be exercised to prevent loss of tools in passing back and forth for repairs. My attention has been called by a store-keeper to a device for track tools that is highly recommended for its simplicity and effectiveness: "Each section foreman is provided with a strong iron ring, made so that it can be bolted together; to this ring is attached a copper tag stamped with the number of section and name of station. The section foreman strings his tools on this ring when he desires them to be repaired and sends them to the shop. A small attachment enables him to send his wrenches on the ring. For crow bars a strong brass band, stamped in the same manner, is

provided. This is a much better way than sending the tools tied together with string." This same store-keeper also has a rack fixed upon springs in which he ships lamps and lamp globes back and forth on the line without the labor of packing or risk of breaking. Indeed, the devices for packing and addressing implements and tools passing back and forth on a line for repairs, would fill a chapter.

The methods enforced by the English companies for insuring faithfulness and care in the use of tools are very sweeping, and I do not know that I can do better than embody the most pertinent here. They are worthy of careful study. They are as follows :—

“ Every mechanic must be provided with such tools as are usual in his trade, and his chest will be examined by the foreman when the workman leaves the service. Every man will be required to see that each of his shop tools bears the initials of the company and his own private mark. Every man borrowing tools from another must be careful to return them immediately they are done with. A list of each man's tools will be kept. When any workman requires a new tool, he must apply to his foreman for it, who, if it be necessary, will either supply it or give instructions for it to be made. All new tools must be given to the men requiring them by their foreman, who will receive those they are intended to replace, and no tools must be made or obtained without such authority. Any man using taps, dies, rimers, gauges, or templates, must see, that when done with, they are immediately returned in the same condition as when received to the person appointed to take charge of them. His not calling the attention of that person to any defects or damage at the time he receives them, will be considered

a sufficient proof that they were then in good order; and if any of them should be lost, the man to whom they were delivered will be held responsible. Private tools are not allowed to be made in the shops under penalty of instant dismissal. Any man on leaving the service of the company, will not be paid his wages until he has delivered up to his foreman the key of his drawer or tool chest, and the quantity of tools charged against him, to the satisfaction of the person authorized to receive the same."

"A lock and key will be supplied to each man's tool box and drawer, in the first instance, which must be kept in a proper state of repair afterwards by the person to whom it is given up. Any person losing the key of such lock must replace it at his own expense; and any man breaking open another man's drawer, box or lock of any kind, will subject himself to dismissal. No workman will be allowed to take out of the works any tools or materials, unless they are specified by his foreman upon the pass, and the number of pieces stated. All passes must be left with the gate-keeper, who is required to take an account of all material of any kind, which passes from the works through his gate. All tools and implements required for the repair of the line, must, when not in use, be kept locked up in a building, or in boxes, for the security of which each foreman or ganger on his own length of line is responsible."

"When a man leaves the service, he must immediately deliver up his uniform and all other articles belonging to the company. Any money that may be due for wages to any man leaving the service will not be paid until the clothing, book of rules, lamps, flags, tools, detonators and all other articles the property of the company which may have been supplied to him, shall have been delivered up. If not delivered up, or if any article be missing or damaged by improper use, the cost of such article or the re-

pair of such damage, shall be a debt due from the man to the company, and may be deducted from any pay then due, and if such pay be found insufficient to meet the claim, will become a debt recoverable at law."

"As regards the engineering department, the tools used by platelayers are in charge of the various way inspectors, and must be replaced when required, in accordance with instructions. Stock must be taken at the end of each half year, when each ganger must give an account of the tools in use on his length, which report must be certified to by the permanent way inspector and sent to the store-keeper. With respect to tools supplied to workmen employed in the permanent way shops, each workman is provided with a drawer or cupboard, with lock and key; the drawer and key must be numbered, and all the tools used by the man to whom the drawer or cupboard is appropriated, must be marked with the same number and stamped with the name of the company. The man will be held responsible for all such tools, and in case of loss, the amount will be deducted from his wages. With regard to the locomotive department, each man engaged in the working of engines, etc., receives a proper equipment of tools, and is held responsible for the care and custody of the same. When an engine is sent into the shops for repairs, the driver must hand in the tools, etc., and if they are found to be complete and in good order, a receipt will be given by which he can claim the tools when the engine is again ready for work. If any irregularity is discovered, the case will be dealt with by fine or otherwise. The regulations in force in connection with the tools supplied to workmen employed in the locomotive shops are similar to those which apply in the shops belonging to the engineering department."

"Permanent way materials are supplied through the chief store-keeper. As soon as they are delivered on the ground, they are in charge of the permanent way in-

spector of the length where delivered. Each inspector is charged from the divisional office with the material supplied to him. He is also credited with all that is used, a daily record of which must be kept by the gangers under him, and sent to the divisional office fortnightly."

"Stock of all material must be taken every six months, and by comparing the stock on hand with the amount charged, the slightest difference will be detected, if any, in each inspector's stock. In the case of small stores, they must be kept in the small stores depots, of which there are three on each division, and requisitions for daily consumption, as required, must be sent by the inspector to the store-keeper. Stock must be taken of these small stores every six months, and the amount on hand checked with the book balances. With respect to tools supplied to workmen, they must be supplied by the store-keeper upon an order from the inspector. Stock must be taken of all tools every six months, so that it may be ascertained if any are not accounted for. Workmen must make good any tools entrusted to them which they may lose."

"Any workman making a tool without directions from his foreman, will be fined two shillings and sixpence. Every man will be held responsible for his tools, and he will be required to see that the initials of the company, as well as his own private mark are upon them, or pay a fine of one shilling; if any tools are lost, their value will be deducted from his wages at the end of the week. Any man borrowing tools from another, must return them, or forfeit the value of the same. Any person using taps, dies, rimers, or other general tools, must see that they are given back, in good order, to the care of the person appointed to take charge of them; or neglecting to do so, to pay a fine of one shilling; and if the tool is lost, its value will be deducted from his wages at the end of the week."

Some of the more pertinent of the rules and regulations that it appears necessary a company should enforce in order to secure reasonable responsibility in the care and use of its tools, may be summed up briefly as follows:—

Tools not in use shall be in the keeping of the store-keepers of a company, and shall be distributed by them.

That the person delivering a tool to an employe for use to replace an old one, shall require the return of the old tool, and in the event it is not forthcoming, shall investigate the reason therefor, and if the holder is responsible for its loss, charge him therefor, which charge shall be paid before satisfaction is rendered for wages due.

That so far as practicable a particular store-house on each division or line shall be designated as a central source of supply for tools on such division or line.

That all orders for tools, either to replace those that have been worn out, broken or lost, or as original stock, shall be made on such store-keeper.

That all tools distributed from subordinate shops, shall be reported to the central shop, the name of the person to whom delivered being designated.

That the central store-house shall open an account with each employe for the tools in his possession, charging him with those delivered to him and crediting him with those that have been returned or accounted for.

That when tools are delivered to isolated gangs of men, including those employed upon the track, the foreman, or other person designated by the store-keeper, shall see to the collection, counting and locking up of the tools each night and that each and every tool is duly accounted for or the fact reported forthwith to the store-keeper.

That a receipt shall be taken for all tools delivered to trainmen and others; that a duplicate of this receipt shall be given to the person receiving the tools for reference.

That at shops a room shall be provided with receptacles for each workman; the tools being placed therein at the close of the day and in the morning when taken away, the receipt of the workman shall be placed in the receptacle in lieu thereof.

When tools are needed and are not intended to replace others, the usual order required in the case of supplies shall be made, and the fact that they are original stock stated.

That the rule requiring that old and broken tools shall be returned before new ones are issued, shall apply also to all implements, such as paint brushes, paint pots, ladders, pullies and tackle, switch chains, lanterns, axes, wheelbarrows, coal buckets and other appliances of a similar nature, the return of which is evidence that the article desired to be replaced has not been lost or misappropriated.

That in all deliveries of tools, receipts shall be taken therefor, so as to prevent loss and insure accurate knowledge as between the sender and receiver.

The foregoing comprises little more than an outline of the plan to be followed in looking after the tools and implements of a company. The subject is further referred to in connection with the Disbursement of Material. Indeed, every chapter of this book contains more or less in regard to it. Those experienced in such matters will readily discover my omissions. Their skill will suggest needed details and I think they will agree with me that the necessity of a company carefully looking after its tools and appliances cannot be over-estimated.

CHAPTER XIII.

SPECIAL REFERENCE TO FUEL.

(NOTE.—In railway nomenclature, the terms “material” and “supplies” are not generally understood to include fuel. Thus, a balance sheet will show two items, one for Material and one for Fuel. In this book, however, the terms “Material” and “Supplies” include everything, the purpose being to treat the subject as a whole, except when the importance of particular items renders additional reference to them necessary, as in the case of Fuel.)

The deterioration of wood commences as soon as it is seasoned for use after being cut. Each day thereafter detracts something from its heat-producing qualities. The process of decay is not the same with all woods, and is great or small according as they are exposed to the elements or otherwise. Coal has much greater heating capacity than wood. Alexander Watt states that the heat disengaged during its consumption is double that of wood. He does not, however, describe the quality of coal used in making the test or the kind of wood. Without this information, his figures are more interesting than valuable. Some woods have double the heating capacity of others. The rapid and almost universal adoption of coal for locomotives has made the value of wood as a fuel purely speculative in the majority of cases; nevertheless, there are many roads that still use wood. In Mexico, the uninviting, scraggy, mesquite is used wherever it can be procured. This

wood also answers better for ties than any other in that country. Some of the roads operating in the great timber districts of the United States still use wood for fuel. The cost per cord delivered on their track is, in many instances, merely nominal; to this must, however, be added expense of sawing, transferring, piling, etc. Valuable woods for heating purposes are hard maple, hickory, beech, hemlock, ash, certain kinds of oak, and so on. Maple may be used to advantage before being entirely seasoned. The resin in hemlock makes it a very desirable fuel in some respects. Hickory is one of the best of woods, but unfortunately it is very scarce. Indeed, desirable wood can, as a rule, be procured only in limited quantities. It is necessary, therefore, to eke out the supply with inferior qualities, so that the average heating capacity of wood is about thirty-one per cent. less than that of coal. The highest quality of wood, when in the best condition for use, affords nearly or quite as much heat as coal, but the mixed woods that our forests afford are greatly inferior. Some woods are so susceptible to moisture that a heavy dew renders them unfit for use until they have had time to dry again. Certain kinds of wood dry so slowly that, when corded up, the outer layers decay before the interior of the pile has become seasoned. Swamp elm will not cure at all. Many kinds of wood have little more heating capacity than paper, and are thrown aside by firemen, as they do the slate found in coal.

The substitution of coal for wood, while it has perhaps, not reduced the cost in every case, has much sim-

plified the procurement of fuel, rendering it possible for railway companies to supply themselves from day to day. Whereas, where wood is used, a year's supply is required in the majority of cases. In the case of coal, only such supply as may be necessary to meet the contingencies of blockades, strikes, delays of transportation, and other accidents of business, need be kept on hand. The amount will vary. Some companies find it to their advantage to lay in a winter's supply in advance, others for a more limited time, still others for only such period as may insure them against unexpected contingencies. Practices are nowhere uniform, but according to the experience and wants of each road.

All kinds of bituminous coal commence to deteriorate in heat-producing qualities as soon as mined; the loss varies according to the quality of the coal and the climate. It is greater when left uncovered. When properly protected, depreciation is slow and in some cases merely nominal for a considerable length of time. Every description of coal contains a considerable amount of moisture. This moisture is not absorbed from the atmosphere, but is inherent. Some kinds of coal are so damp when taken from the ground as to greatly detract from their value for immediate use. In high altitudes, where the weather is warm and dry, disintegration of bituminous coal is so rapid as to render it of little or no value within a few weeks after being mined. Throughout the greater part of the United States and Europe, however, disintegration is much slower. In fact, the length of time soft coal may be preserved depends, within cer-

tain limits, upon the nature of the protection afforded it. If the mass is sufficiently great to preserve the interior from atmospheric action, deterioration is less marked; the outer covering, however, suffers according to its extent. When bituminous coal is left uncovered, the deterioration is immediate and rapid, multiplying in intensity with the lapse of time.

A gentleman thoroughly familiar, by many years of practical experience, with the use of bituminous coal, writes me as follows:—

“Opinions differ in regard to the depreciation of bituminous coal, even among those who handle it daily, and when called upon to state the percentage of depreciation, the most surprising differences are noticed. Much depends upon the weather. If in mid-winter the air is dry and steadily cold, the loss will not be so great as it would if there were light snow or rain with occasional sunshine. In summer, rain and sunshine accelerate destruction. I was inclined at first to say that the loss of coal for one month, if properly sheltered, would be nothing during the summer season. This is not true, however. There is a loss sustained, even during so short a period, not so much from atmospheric depreciation, however, as from handling. It is first thrown from the cars into the stock shed. If the shed is one half full or more, it must then be thrown to the back side of the shed. When needed for use, it must be shoveled into a bucket before being thrown into the tender. Under this handling, the coal rapidly disintegrates and the result is that more or less of it crumbles into dust. I place the depreciation of bituminous coal at eleven per cent. for six months when exposed and at eight per cent. when not exposed. Recently, in cleaning up a coal shed I

found the loss to be as stated. The coal was badly slacked and when used went through the fire-box and, flues like so much chaff. The harder an engine is worked, the more difficult it is to keep the slacked coal (dust) in the fire-box. In many cases it does not ignite at all, or ignites as it is passing through the smoke-stack, or even after it has left the latter. The heating capacity of such fuel is merely nominal under the most favorable circumstances."

This gentleman submits a table in which he estimates that the weather waste of bituminous coal at Chicago is as follows:—

TIME.	SUMMER.		WINTER.	
	EXPOSED.	UNDER COVER.	EXPOSED.	UNDER COVER.
One month.	Two per cent.	Very little.	Three or Four per cent.	None.
Two months	Three and a half per cent.	Two per cent.	Four and a half per cent.	Very little.
Three "	Four and a half per cent.	Three and a half per cent.	Five and a half per cent.	Two and a half per cent.
Four "	Six per cent.	Five per cent.	Six and a half per cent.	Four per cent.
Five "	Eight " "	Six and a half per cent.	Seven and a half per cent.	Five " "
Six "	Eleven " "	Eight per cent.	Ten per cent.	Six " "

As he states, the ratio of depreciation is the subject of more or less dispute; no two agree in regard to it. I am inclined to think that he under, rather than over, states the loss. However, his experience and observation make his estimate of considerable value. If the table could be continued, however, it would be found that depreciation was much more rapid after six months than before. When we remember the relation that the cost of fuel bears to the total cost of operating a railroad, the extent of the loss from depreciation becomes manifest.

These facts are well known to the officials of railroads who handle fuel and are a constant reminder to them of the necessity of keeping the supply on hand as small as is consistent with safety.

In reference to the different qualities of coal and their constituent elements, and conditions under different circumstances, the following communication from Mr. G. M. Davidson, Analytical Chemist, (for which I am much indebted to him) affords much interesting information. It will be noticed that his enquiries do not tally in all respects with the conclusions I have noted. These differences are in some cases inherent, in others not; he says:

“In regard to the weathering or depreciation in value of coal after it is mined, there is but a small amount of reliable information. To carry on such an investigation as would yield accurate results requires a great deal of time, and but few chemists have ever undertaken the task. Most of the investigations, the results of which have been published, were carried on by German chemists at the German Universities.

By the term weathering or weather waste of coal is meant the deterioration in value which coal undergoes when exposed to the air under various circumstances. This deterioration is due to the action of the oxygen of the air upon the carbon and hydrogen of the coal, and also to the decomposition of the impurities of the coal, chiefly iron pyrites, which are always found in greater or less quantity mingled with the coal.

The composition of bituminous and anthracite coal is shown by the following table:—

	BITUMINOUS.	ANTHRACITE.
Carbon.....	75 to 80 %	90 to 94 %
Hydrogen.....	5 to 6 "	1 to 3 "
Nitrogen.....	1 to 2 "	1 to 3 "
Oxygen.....	4 to 10 "	1 to 3 "
Sulphur.....	0.4 to 3 "
Ash.....	3 to 10 "	3 to 4 "

When coal is exposed to the air, the chemical changes which take place are as follows: The coal absorbs oxygen from the air. A portion of this oxygen combines with a portion of the carbon of the coal, forming carbonic acid gas, another portion of the oxygen unites with part of the hydrogen, forming water, another portion of the oxygen combines with various organic parts of the coal and the remainder is used by the iron pyrites and forms oxides of iron and sulphuric acid. This acid at once unites with any lime, clay, etc., which is present, and is soon washed out if the coal is exposed to the weather, but appears as white streaks if the coal is kept under cover.

The effect of weathering is to diminish the carbon and hydrogen and increase the oxygen in the coal. The organic or combustible part of the coal is decreased, and the ash or inorganic part is increased. The heating power of the coal, and consequently its value, is thereby diminished, and when the coal contains more than a trace of iron pyrites, disintegration or slacking takes place, owing to the fact that the products of the oxidation of the pyrites occupy greater space than did the pyrites, and in a short time the value of the coal is very much diminished.

The deterioration of coal due to the action of the oxygen is increased by elevation of temperature, and takes place even when the coal is dry. The deterioration due to the oxidation of pyrites requires the presence

of moisture. Hence the greatest deterioration to coal occurs when it is exposed to the action of the weather during the hot months, and the least deterioration when it is under cover during the cold months.

Prof. Grundmann, of Tarnowitz, by analyzing coal before and after exposure to all conditions of weather, in a pile of about 300 tons, found a loss of volatile matter of 58 per cent. in nine months. Another sample of the same coal protected from rain and snow lost 43 per cent. in nine months. Both samples lost their power of cooking in two to three months. He found that the decomposition takes place in the middle of the pile the same as on the surface, and that the rate of deterioration reached its maximum about the third or fourth week, and that one-half the total oxygen absorbed was absorbed during the first fourteen days. He also states that coal poor in oxygen absorbs it most rapidly. Coal which he examined when freshly mined and found would make good coke after exposure, either would not coke at all, or made a very poor quality of coke.

Prof. Varrentrapp, of Brunswick, found by his investigations that the oxidation of coal takes place rapidly at ordinary temperatures when moisture is present. He found the weather waste in some cases amounted to 33 per cent., and in one instance decreased 45 per cent. in gas yielding qualities, and 47 per cent. in heating power, while the same coal kept under cover lost in the same time 24 per cent. for gas purposes, and 12 per cent. for heating purposes. These experiments were made with German bituminous coal.

In regard to the weathering of anthracite coal, I find that the general opinion of chemists is that it is but very little if at all affected by exposure to the weather. Lumps of anthracite have been examined which have been exposed to the weather for 30 years and found to be first class fuel.

In regard to the effect of the weather on bituminous coal, I find that the universal opinion of chemists is briefly as follows:—

Nearly all varieties of bituminous coal deteriorate to a great extent when exposed to the air. This deterioration is greatly favored by high temperature and in coals which contain iron pyrites by moisture. In coals free from iron pyrites this deterioration seems to be as rapid when the coal is dry as when it is wet. It is always increased in all kinds of bituminous coal by increase of temperature, and is more energetic when the coal is in dust or slack, especially when it is accumulated in large heaps which are without ventilation, and so retain nearly all the heat which is developed."

The quality of coal from no two mines, it will be observed, is alike, nor indeed from different parts of the same mine. These differences serve therefore to destroy, to a certain extent, the value of tests made of a particular coal so far as they apply to other coals.

The differences in the quality of bituminous coal is as marked, probably, as in any other material that a railway company uses. A moment's conversation with an engineer or fireman discovers this fact: he will tell you that the coal from a particular district burns easily and uniformly, and is a good steam-producer; that another is very fair, but not so good; that another contains too much sulphur; that another is lacking in vitality; that another contains so much slate as to be practically worthless; that another is too damp when mined to burn well, and so on. The great value of the practical knowledge that engineers and firemen possess in regard to fuels is well understood by railway companies.

The use of coal is more destructive to the fire-boxes of locomotives than wood, because of the sulphur it contains and the gases that emanate from it. The latter condition is intensified when hard coal is used, being so powerful, indeed, in some cases, as to greatly discommode both passengers and crew. The fire, moreover, from hard coal is so intense, I am told, as to quickly destroy the fire-box of a locomotive.

The peculiar features that attend the use of different kinds of wood and coal, and the further fact that no two kinds possess the same heating capacity, make their use a matter of experience and careful study. If the special adaptability of a particular fuel is not accurately known and acted upon, wastage occurs as a matter of course. When the kind and quality of fuel is the same, there exists the greatest possible difference in the ability and disposition of firemen to use it effectively. Observers estimate that there is fully twenty per cent. difference between a good and a poor fireman in the fuel used. It will be seen, therefore, how important it is that a company should be able to determine accurately and quickly between them. Those familiar with such matters assert, and truly, that each engine has peculiarities of its own, that must be regarded in firing, if efficiency and economy are to be secured. This is impossible, it is manifest, if firemen are changed frequently from one machine to another. Not only do they not possess the requisite knowledge of their work in such cases, but the disposition and ability to hold them responsible is greatly lessened, and, in many instances,

entirely wanting. Moreover, it is impossible, under such circumstances, that men should feel the interest in their work that they do when it is conducted more systematically and with a more intelligent view of increasing their knowledge and attachment. In order to secure the highest results obtainable, the most scrupulous observance of every necessary detail should be practiced. The fireman must, in the first place, be familiar with the fuel he uses, and understand thoroughly the peculiarities of the locomotive he fires. Afterwards, the performance of each fireman must be studied, not generally and cursorily, but exhaustively and minutely. As this supervisory work increases, the disposition to neglect essential details will multiply. It must not be forgotten, however, that a company is the loser by neglect, no matter from what source it arises. The multiplication of engineers and firemen upon railroads should be attended by the multiplication of methods necessary to supervise their work intelligently. Upon a small road the work may be done very fully by the manager or master mechanic, but when these officials are more fully occupied, the duty must be delegated and must keep pace with its growth.

A store-keeper whose opportunities of observation are quite extensive, writes me in regard to the use of fuel as follows :—

“A vast quantity is wasted through imperfect knowledge of the art of firing; how to teach men to extract the greatest amount of heat from the least amount of fuel, and put in practice such knowledge, is a thing that suggests itself to every railroad manager. I would sug-

gest the appointment of an officer who understood the principle of combustion, and who was endowed moreover by nature with the faculty of influencing others. It should be the sole duty of this man to instruct employes in the use of fuel and oil; to make the work his exclusive study. Not only should men be verbally instructed in the use of fuel, but they should be provided with a concise formula setting forth the principles. These formulas should not only be learned by those who actually perform the work, but by those whose duty it is to employ such men or supervise their work."

These facts are well understood by railway companies.

Fuel is the most difficult of all material to care for. The accounts connected with it are also the most unsatisfactory. The general use of fuel by the community makes its possession a matter of common concern. But if it were never stolen except by those actually suffering for want of it, its loss would be less aggravating to railroad companies. Unfortunately this is not the case. From the time it leaves the mines, until used, it is subject to the depredations of pilferers. It is thrown from the cars while en route, and is surreptitiously taken from yards and store-houses, even from the locomotive tenders. Nowhere is it safe for a moment except within secure enclosures. These facts are thoroughly understood, but lack of proper facilities for storing renders it impossible to avoid loss in many cases. When wood was more generally used, the poverty of the companies and the enormous supply of fuel required to be kept on hand, rendered it impossible to place it within secure houses or yards.

When coal supplemented wood, little better provision was made. A certain per centage of loss was expected as a matter of course. Where the omission has not been remedied, the losses, in the majority of cases, warrant the construction of secure store houses, or the constant employment of trustworthy watchmen. The general disposition evinced to erect secure buildings where only sheds and open yards before existed, is an evidence of the appreciation of the subject by railway companies. Fuel should be quite as inaccessible to the public as any other material. If exposed to depredations in yards, the fences around it should be so high as to practically preclude their being surmounted; if placed within a building, the latter should afford absolute protection. The annual expense for interest and maintenance this will involve will be, in the majority of cases, slight compared to the losses that occur when such precautions are neglected. The introduction of coal in the place of wood has much simplified matters. It has rendered it possible to surround the material with proper safeguards; to determine how much is bought, its quality and how and when used. Coal has numerous other advantages over wood; it is as a rule cheaper, it is not so subject to the danger of fire, is more compact, and the ease with which it may be procured renders it unnecessary to keep on hand a large supply. The handling of wood, moreover, involves exceptional expenses in inspection, supervision, depreciation, etc.

The cost of fuel forms a large percentage of the expenses of a railroad — fully fourteen per cent. This is

increased or lessened according to the intelligence and care with which it is purchased, cared for, and used. Much thought has been given to the subject of its use. Employees have been stimulated in every way to exercise economy. In some cases, rewards have been offered for those who showed the greatest intelligence and care in this respect, and punishment meted out to the unskilful and improvident

The methods of accounting for fuel are not uniform any more than they are in other respects. A very good system provides for furnishing those who use coal or wood with tickets for different denominations. Thus, upon the delivery to a particular locomotive of two cords of wood, a ticket for the amount is given by the engineer to the store-keeper. The same rule is observed in regard to coal. This plan works very well, but is not in all respects satisfactory. The number of tickets that must be kept on hand in the operation of a road is so great as to render accurate handling exceedingly difficult. The tickets received in exchange for fuel are assorted and distributed again. In this process the tickets for different engines frequently get mixed. Moreover, engineers are not always able to guard them properly while in their possession. The rivalry that exists as to who shall do the most work with the least fuel, leads to irregularities, to the taking of fuel without giving a ticket in return, or the use of the tickets of other locomotives when opportunity offers. These, and other difficulties serve to disturb the fuel accounts. It has been suggested that a blank form would be better than a ticket, the different

kinds of fuel being printed on the blank so that the recipient of the fuel can note down quickly the amount opposite the kind received by him. This would do away with the re-distribution of tickets and would greatly lessen the embarrassment of handling. I am inclined to think this is altogether the best plan. If the engineer or person is careful, he can render it impossible for anyone to counterfeit the receipts he gives, thus charging him a greater amount than he actually uses. This is important. Moreover, after the receipts have been used in auditing the account, they may be returned to the person who gave them so that he can assure himself that nothing has been charged to him improperly. This plan will not only greatly reduce the labor, but prevent many of the impositions that are practiced where tickets are used. The form of receipt used by engineers will also do for conductors, station agents, and others who have occasion to use fuel. The practice upon some roads, particularly upon English lines, is for the fuel agent to exact a receipt for fuel delivered by him (the receipt being written by the agent), a statement of the amount being given at the same time to the person to whom the fuel is delivered. This plan is the most desirable one where time and clerical facilities permit its operation. In other cases the plan previously described is the best. If enforced with reasonable intelligence and certainty, they will, separately or together, secure absolute accounting so far as appliances for handling fuel permit. The haste, however, with which fuel is loaded, and the impossibility of being entirely accurate as to quantities, will, as is well known, always create more

or less differences in fuel accounts. The differences, however, are wholly matters of accounting. They are important only so far as they render it difficult or impossible to determine as to the economical use of fuel. But as this latter is a matter of the greatest concern, it must never for a moment be forgotten or ignored.

In order to determine the measure of economy exercised by employes, careful comparisons should be made of the fuel used on different locomotives for the same month and for the same line and for different lines. Comparisons should also be made of the consumption of the same locomotives for different months. Similar comparisons should be made of fuel used at stations, in cars and elsewhere; whenever, in fact, conditions are similar or the zeal of operatives is likely to be increased thereby.

The method of handling fuel varies according to the experience, talent, and prejudice of men. Upon some lines it is handled wholly by operatives; upon others, the work is done entirely by contract. Both methods have their advocates, and are successful according to the measure of intelligence and energy that is used in enforcing them. The fuel supply located at stations is very generally and properly entrusted to the care of the agent. At shops and elsewhere, it is in the interest of economy and efficiency to entrust it to the store-keeper, unless special reasons exist for making other disposition. The supply of fuel kept in stock will, it is manifest, depend upon the circumstances attending its procurement. When it is necessary to lay in a winter's supply,

requisitions should be made at a stated period far in advance, so that provision may be made for buying and due economy used in shipping.

CHAPTER XIV.

IN REFERENCE TO DISBURSEMENT OF MATERIAL.

No material should be disbursed except upon a requisition or order.

The disbursement of material takes cognizance of the article, quantity to be distributed, time, manner, and use to which it is put. The higher the degree of intelligence and interest evinced in disbursing, the greater the care in using.

A Requisition embraces material to be purchased, or transferred between store-houses. An Order covers material taken out of store to be consumed. The latter applies in the present connection.

Orders should be filled up uniformly by the same hand, and all blank lines duly cancelled so that nothing may be added after the approval of the order. Orders for material should be delivered at the time the material is taken from the store. The English rule provides that "any workman desiring material of any description, including deals, planks, battens, timber, or scantling, and taking them out of the yard without first making application for them at the office will be discharged." Orders should give the name of the person to whom material is to be delivered, the work upon which it is to be used, and

if possible, the name or number of the workman who is to use it. The effect of this will be to particularize the transaction; to make all who are concerned feel the responsibility that attaches to their action. Orders should be signed by the foreman or person desiring the material and should be countersigned by an official having cognizance of its need and use. They should be definite, both as regards the article and quantity. Thus, orders would not run for "Nails," but should specify the kind and quantity. These things seem immaterial, but they are matters of every-day occurrence in actual practice, hence, should receive notice. Orders should specify the use to which material is to be put, and the account to which it is to be charged. This information is necessary to adjust the accounts. It has another purpose, however, namely, to enable the store-keeper to judge as to the wisdom and expediency of the order as regards quality and quantity. All orders should be carefully filed and preserved by the store-keeper; they should form the basis of his accounts and the justification for his distribution.

In distributing material, that which is oldest or most likely to decay should be used first. This is especially necessary in regard to lumber, timber, fuel, and similar supplies. The person having charge of the distribution, should be familiar with the stock, where located, and its extent. He should also be experienced, if possible, in the requirements of particular classes of work, so that he may not only anticipate its wants but judge of the interest and care that is exercised in ordering the material. It is desirable that a particu-

lar man should be assigned this work, and when the duty is not sufficient to give him constant employment he may be assigned temporarily to other work, but this duty should take precedence of all others. It is of the utmost importance that the person making disbursements should be skilful in the discharge of his duty. He should not only be familiar with the purposes for which material is used, but he must know how to load it into cars and pack it into boxes or otherwise arrange it as may be best for shipment. When this work is performed by an inexperienced person much damage is occasioned from imperfect loading and packing and expense is further increased by the time he wastes in the performance of his work. In loading goods reference should also be had to unloading, the total cost to a company being considered, rather than the cost of loading alone.

Orders for material should be carefully scrutinized by those experienced in such matters and should be reduced to the minimum in every instance. When disbursements are in excess of actual needs, the tendency is to encourage careless handling and improvident use. If the amount delivered is only sufficient to cover the work, its economical use is necessary; if in excess a margin is left for waste. The duty of store-keepers, as already intimated, does not end with the filling of an order and the delivery of the material. Their personal responsibility ends there under certain conditions, but the duties of their office require that they follow the material into the workshop and into the hands of

individual workmen and see that it is used as stated, taking note of those who use it extravagantly and of those who use it prudently. And they should remember that it is quite as important that the latter should be recognized as the former punished, indeed, the prevention of the former is dependent upon the latter.

In forwarding supplies to points on the road, the utmost ingenuity and forethought must be exercised to accomplish the purpose with the least outlay. Unless the demand is imperative, the rule in regard to the carriage of freight for the patrons of a company should be observed, namely, the material should be taken to the station and way-billed the same as freight, or if in car-loads, may be loaded directly at the store-house if facilities permit. When material is shipped to local points in small quantities, it should be forwarded as way freight. The imprudence of using a car in such cases cannot but be apparent. It is, however, frequently overlooked, because of the fact, probably, that the property belongs to the company. This sometimes leads to great extravagance in the use of a company's equipment, a car capable of holding twenty tons being loaded, sealed, and forwarded, with only a morsel of freight.

Material should never be disbursed in advance of its actual need, and orders should not be magnified in order to save the labor of frequent shipping. The economical use of material is dependent upon the supply being so limited that the person using it shall be constantly impressed with the scantiness of the store and the necessity for its being carefully husbanded. The number

of a company's store-houses should be restricted as much as possible, if economy is to be considered. The small supplies used at isolated round-houses, local car repair stations, and similar places, can be accounted for to the nearest store-house and returns made from them; there is no occasion for establishing petty depots for this kind of material. It should be remembered that the moment material leaves a store-house extraordinary risks attend it. Moreover, undue disbursement of material prevents accurate knowledge of the amount on hand, thus involving, with other evils, a larger supply than would otherwise be necessary. Material is nowhere so safe or wisely disposed as in the immediate charge of a store-keeper. Its disbursement corresponds to the disbursement of money by cashiers. When received, it should be inspected with the utmost care; when in the store, it should be watched with unceasing vigilance. The value of these is lessened, however, if a like intelligence does not attend its disbursement. In disbursing, the store-keeper is required to see that neither too much nor too little is given out; that it is disbursed only on proper vouchers and to the right person. A cashier knows that if he pays out money not called for by his voucher, or if he loses this voucher or neglects to record it, that his cash will not balance at the end of the day. This is just as true of the store-keeper as it is of the cashier, except that in the latter case the balance tallies to a cent, if proper care has been exercised, while in the case of the store-keeper trifling discrepancies are inevitable. But if proper care is exercised, the amount of

material disbursed, notwithstanding small discrepancies arising from differences in prices, weights and other circumstances, will correspond within a trifling sum of the amount charged, while the supply on hand will always tally within a few cents of the debit balance on the general books. It is desirable in disbursing material that the charge should be on the safe side, i. e., that it should be enough; but the amount should not be excessive. A comparison of the inventory at the close of the year with the balance standing to the debit of a store-keeper, will (after making allowance for difference in prices, measurements, etc.) afford a very fair indication of the care and intelligence he has exercised in handling and disbursing the material in his charge. Every company should have a general store-house from which material may be supplied to lesser store-houses as needed. This general store-house will also serve as a local depot. Its judicious use renders it possible for a company to reduce its supply of material much more than it can under other circumstances, as the disposition is general for every supply station to multiply its necessities in the absence of a central depot. But if orders can be filled at a moment's notice from a central store, local store-keepers can be restricted to such supplies as are necessary to meet current wants. They have not only no motive to increase the supply unnecessarily, but are encouraged to decrease it so that the labor and responsibility attending its care may be reduced to the minimum. In reference to the necessity of distributing supplies at night, or in the absence of the store-keeper,

a capable and trustworthy person should be selected by him to perform this duty, and should be governed by the rules and regulations that apply in other cases. When proper forethought is exercised, however, there will be very little demand for supplies in the absence of the store-keeper; but in order to meet unavoidable cases, provision must be made. This necessity will be found in regard to lubricants and tools required by locomotives. In reference to the latter, a good plan is to provide a secure cupboard in the round-house in which an assortment of tools may be kept but which may not be disturbed without the return of the old tools or a compliance with the rules governing in such cases. To facilitate the easy shipment of stores, it is desirable that there should be a track on each side of the store-house, but it is of more importance that the floor of the store-house should be on a level with the floor of the car. One man can under such circumstances perform as much labor as two men under other conditions. The value, therefore, of such an arrangement to a company cannot but be apparent.

In shipping material, an invoice should accompany or precede the same. This invoice should be signed and returned in every instance. In filling orders for tools, the invoice should be accompanied by a duplicate, which the recipient should retain. These details, as well as others connected with the distribution of tools, track material, oils, brasses, fuel and train and station supplies have been treated somewhat apart in chapters devoted especially to such subjects.

In filling requisitions of section foremen and other workmen located at isolated points, such as car-repairers, foremen at round-houses and similar employes, a duplicate of the invoice should be sent to the store-keeper in charge, so that he may be immediately advised of the transaction. The original invoice should be sent with the goods; on receipt of the supplies this original should be signed and sent to the store-keeper in charge, who, after transcribing it on his books, will forward it to the person who shipped the material. This method is somewhat round-about, but serves to facilitate perfect concurrence between the person forwarding the material and the person to whom it is charged by him. The difficulties attending the disbursement of material used in bridges and buildings is referred to somewhat at length in connection with track supplies. This material is so scattered that a store-keeper has much difficulty in keeping track of it. He must depend on the reports of foremen of the amount received, used, and transferred. If there is neglect or inaccuracy in making these returns, it involves corresponding inaccuracy in the store-keeper's books. He is compelled, therefore, to exercise the utmost diligence and ingenuity in ascertaining the location of supplies and tracing their disposition. In pursuance of this he will find it necessary to make frequent inventories of the property in his charge. The desirability of keeping track of the material in detail is apparent; if overlooked, it is liable to be misappropriated or forgotten. Moreover, a stock is greatly increased by such neglect, and the opportunity to discover waste or extravagance lessened.

In shipping supplies, station agents should be furnished with full particulars for billing; clerical use should be made of the blank upon which the order is written, each article being checked thereon. The invoice should be made from this order. Great care must be exercised to see that requisitions and orders are duly charged. Boxes of suitable design and size for use in shipping station supplies and kindred material, should be provided. These boxes should be returned to the sender forthwith. They may be used for years. They should be adapted to protect the property and facilitate packing.

In the disbursement of raw supplies to be used in manufacturing articles, such material, it should be borne in mind, does not in any sense of the word pass out of the hands of the store-keeper. It is his duty to watch it unceasingly, to see what disposition is made of it, and that accurate account thereof is kept. This phase of the subject has, however, been referred to quite fully in the chapter on manufacture and repair of articles, and need not, therefore, be further entered into here.

SPECIAL REFERENCE TO TRAIN, STATION AND OFFICE SUPPLIES.

Many of these supplies are of so little account as not to seem to justify keeping a record of the use of each. The benefit of such an account is not apparent at a glance, but more careful study will correct this impression. It is even necessary to take cognizance of each blank that is distributed. The cost of the blank considered by itself may not justify this surveillance, but the aggregate

cost of blanks coupled with the possibility of their being lost or wasted if detailed accounts are not kept, justifies it, even if the general spirit of economy it inculcates did not.

In distributing supplies to replace such articles as water-buckets, glasses, dippers, lanterns, brooms, ink-stands, erasers, cuspidors, and kindred property, what plan should be observed? Is it not desirable that the old article should be returned, as in the case of tools described in the chapter on tools? Is not the rule as valuable and as necessary here as in the case of tools? I assume that it is. That the rule of exchange should be observed, when the return of the old article is desired to prove that it has not been lost or misappropriated.

In order to make the supervision of train and station supplies as effective as possible, an account should be opened with each person to whom they are furnished. Orders should be scanned first to judge of the economy that has characterized the use of the preceding supply, and second, the propriety of the present one. I do not mean that a book account in dollars and cents should be opened with each employe, but that a record of the articles furnished should be made. To facilitate this comparison, blanks, instead of books, may be used if thought better. It is not necessary to go into elaborate book-keeping, the method of keeping the account should be made subservient wholly to the purpose, which is, to see that orders are restricted within reasonable limits and are carefully husbanded. The record is of no value further

- than to aid in this, and the simpler it is, therefore, the better.

Every employe should order uniformly of a particular store-keeper, as in the case of tools, or in the event this is impossible, the orders (or copies thereof) should be forwarded to a central store-keeper that there may be somewhere a full account of the orders of each individual, so as to fix responsibility and secure economy. Orders for station and office supplies should cover a month's need if possible. In the case of stationery, three month's supplies should be ordered, unless the consumption is great. The general rule should be to restrict orders to the amount that can and will be carefully cared for and used; to facilitate this, careful comparison of supplies used should be made. In the case of fuel, oil and almost every description of supply, the known needs of the station or place making the order will aid as a guide to the store-keeper in disbursing. Excesses of every kind should receive prompt investigation.

Reference has been made in the chapter on oils to the plan of supplying stations along a line monthly, from a tank sent over the road for that purpose. It has been suggested that all station and office supplies that are required may also be distributed from a car sent over the road monthly for that purpose, thus completing a work within a day or two at slight expense, that would otherwise require weeks for its consummation and much greater cost. The distributing car should be fitted with compartments so as to be adapted to its purpose. This would, in many cases, save the necessity for packing

goods, and if racks were provided for lamps, chimneys and kindred supplies, the necessity of boxing each article separately, as at present, would be avoided.

The value and number of tools, appliances and supplies in the hands of many agents, conductors, and officials is so great as to seemingly warrant the appointment of a person to look after them. This is true of large stations, of wrecking trains, and of dining and sleeping cars. In the absence of such a person, however, the storekeeper should designate some one whose duty it should be to look after this description of property and account for it. In the case of the common tools and appliances used in cars, the frequent changes among train men make it difficult to fix responsibility for property of this nature that is lost or destroyed. It is sometimes overlooked or unavoidably left behind in the case of accidents and detentions and is, moreover, liable at all times to be stolen without any one being to blame. It is exceedingly difficult to follow the use of tools upon trains or trace their loss, nevertheless reasonable responsibility may be secured by inspecting the supply at the end of each trip. In case of loss, the burden of proof here, as in other cases, rests on the person in charge. This will compel him to examine minutely into the supply of tools turned over to him by his predecessor and to watch them while in his hands, both of which things are as necessary to the safety of the public as they are to the careful husbanding of a company's property.

The system of exchanges and the necessity of careful accounting applies to all classes of station, train,

office and shop tools and appliances, without reference to their quantity or value; to the cooking utensils, crockery, silver-ware, napkins and other appurtenances of dining cars; to the food, cigars and liquor furnished them; to the blankets, linen, toilet articles and other appliances of sleeping, drawing-room and business cars; to the tools and accessories of wrecking cars; to the fuel, oil, stationery, trucks and innumerable tools of common utility in use about a station; to the implements in the hands of trackmen; to the axes, saws, hammers, coal-buckets, and lanterns to be found in passenger and baggage cars; to the switch-ropes, jack-screws, wrenches, and other implements used on caboose cars; to the hammers, files, chisels, oil cans, packing hooks, and other articles needed upon locomotives; to the tools of carpenters and machinists; to every conceivable kind of portable property, in fact, that the necessities of a company compel it to entrust to the care of its employes. Many of the supplies are very simple, and the task of providing minute rules and regulations governing their disposition in each case would be impossible here. I have, therefore, simply attempted to explain the principle or theory of accounting that is necessary to secure efficiency and economy. It must not be forgotten that the method, whatever it may be, must adapt itself to particular cases. Thus a system of returns that would be sufficient to prevent loss or misappropriation of tools in the hands of machinists, would require considerable elaboration of detail in order to compass the needs of dining cars, where the utensils furnished are more complete and myriad in number. In

the case of dining cars, and indeed of all commissary or sleeping cars, the rule should be to make the official immediately in charge of the car responsible, whether he be a porter or conductor. He should be debited with every article supplied him, from the Turkish rug that lies on the floor to the silver tea-pot that sits on the supper table, omitting no article great or small. At the close of each trip he should report, in alphabetical order, the number of articles of each kind on hand at the date of the last return; the number received since; the number delivered up; the number destroyed or lost (with an explanation in each case); the number on hand. A similar detailed return should be made of the articles of food in his hands, given in alphabetical order. Thus, he should report the number of pounds of bacon on hand at the close of the last return; the number supplied him since; the number he has found it necessary to purchase; the amount consumed; the amount otherwise disposed of or spoiled or lost; the amount on hand. In the case of liquors, he will observe the same rule, except that he will substitute bottles, quarts, pints, or half-pints, for pounds, giving the amount in dollars and cents received on account of each; this latter he should also do with articles of food when he receives a specific price for each. Returns of this kind need not be entered on any book of record. They furnish a record in themselves. Upon receipt of the return the store-keeper should refer to the preceding report to see that the amount stated therein as on hand agrees with the amount brought forward, as shown by the current report; that the amount of supplies received

corresponds with the amount that has been delivered; that the report of articles purchased, used, returned, damaged, destroyed, on hand, etc., are specifically true, so far as he is able to determine. Each return should afford in itself a complete history, and after being examined should be filed away for future use. These returns, it will be observed, are at once a complete statement of the property and an inventory. The storekeeper should verify their accuracy as often as once a month by personal inspection, except in the case of linen, which should be inventoried at the close of each trip; in taking this last named inventory, the unsoiled articles should first be counted; those that have been soiled should then be carefully assorted, after which they should be turned over to the laundry, the inventory made of them serving not only as a record, but as a charge against the laundry. No particular day should be designated for taking inventories of articles in the hands of dining car and similar officials. It should be done at infrequent periods, daily if thought necessary, but never allowing more than a month to elapse. In the case of dining, sleeping, commissary, and similar cars, losses will occur through the carelessness and improvidence of employees, no matter how careful the discipline. It is the custom in such cases to require the delinquent to pay for the property, except in the case of glassware and crockery, when the ordinary risks attendant upon use are borne by the company.

In closing this reference to the appliances and supplies of trains and stations, I wish to reiterate what I

have already said of the necessity of frequent, simple and accurate accounting. The form of returns suggested herein for reporting articles in use upon dining, sleeping and commissary cars, is well adapted for the general use of agents, track foremen, train men and others who have tools and implements in their hands. It does not necessitate book-keeping and is at once cheap, simple and comprehensive. It furnishes a complete statement of property; the number of articles, or the amount of supplies on hand at the time of the last report; what has been received since; what has been used, returned, destroyed or damaged since, with explanatory statements when needed; what remains on hand. The record is complete, and does not need to be re-transcribed.

CHAPTER XV.

CORPORATION PARASITES — THE KIND OF MEN
NEEDED TO SUPERINTEND THE CONSTRUCTION
AND OPERATION OF RAILROADS—HOW TO DE-
TERMINE WHETHER CONSTRUCTION WORK HAS
BEEN DONE ECONOMICALLY OR NOT—CON-
STRUCTION SUPPLY DEPOTS.

The difference between a great man and a little man is nowhere more strikingly apparent than on a railroad. The situation requires the former. He alone can comprehend the great affairs that fall to the lot of railway

managers. And by managers, I mean the officers of a company having charge of its great departments and fields of operation. A little man in an office of this kind is a pitiful spectacle; a fly revolving upon a wheel, impotent, a weight merely, dizzy and bedraggled; alone, of all the world unconscious! The type is harmless, and to be found only in subordinate positions; at most only retarding better men.

But there is another and a malignant type, the man of all work, the go-between, the tool of those who conspire in the third person. A man of talents, popular with the superficial, plausible, oily, a veritable scavenger. A courtier skilful in intrigue, with the habits of a mole; a back-biter withal, as full of tattle and slanderous insinuations as a crone of ninety; a man full of smiles for favorites and baleful suggestions for others; secretive as a rat, timid, irascible, lazy, sly, a man essentially mean, of jealous disposition, ambitious without reason, a parasite, tenacious of place, passé, living on with no good purpose; a being like unto those whom Thad. Stevens described when he said he was being "nibbled to death by pismires." No one has ever occupied an official position, but has felt the sting of this pest, a sting that irritates and poisons, sometimes kills. The type is rare.

What is needed in the management of railroads, is equally necessary in their construction. The person in charge of such work should be a man of talent, experience and energy. Such a man as we find occupying the office of responsible manager of a railroad. One of the best type, with luminous mind and executive talents of

the highest order. I have had occasion to describe some of the characteristics of this official in a previous book. But imperfectly, and from one point of view only. I sketched roughly, and at best only his iron side. The side that the public see; his official countenance, behind which is hidden the responsibilities of his office. His personality, however, is directly the opposite of this. It is, compared with it, like the delicate tendril that clings to the rough oak, the moss that is nourished in the crevices of an iron cliff. Like every really strong man with proportionate physical and moral force, his sternness is largely conventional, sometimes wholly superficial, a cloak to his sensibilities. When appealed to by the distressed and the weak, his heart responds with the warmth and impulsiveness of a woman's. To the world his face is marble, his heart granite; face to face with man's weakness and necessity his countenance is flexible with kindly emotions, his heart stirred with generous thoughts. Such are the responsible managers of railroads separated from the cares and ambitions of place; men at once sympathetic, loyal and strong; the Cromwells of our time. The railway officer *per se* is something new, something little understood; he is the product of a new epoch; the creation of a new civilization. A man of affairs, of lofty aspirations, devoted to his employer and believing in the equities of his case. Versatile in his acquirements, free from prejudices, destitute of hobbies, wise, experienced, companionable, with charitable thoughts he stands ready to meet the world more than half-way in every generous and manly impulse.

In selecting a man to take charge of the construction of a road, the more nearly he possesses the characteristics required in the physical management of railroads, the more nearly he will accomplish the high possibilities of his office. He must be a man able to foresee events and control circumstances. If he is lacking in capacity and resolution, his fretful forebodings will accurately forecast results. His work will be attended with the same unfortunate circumstances that attend the work of similar men in other walks of life. Nothing will transpire as it should; supplies will be inadequate in one case and excessive in another; they will not reach the place where needed or when needed; delay instead of expedition will characterize the work. All his plans will be disturbed by discordant jars, while in the hands of a capable man the happy conjunction of circumstances that attends the construction of a railway seems to make it the simplest task in the world.

The great development of railroads and the enormous aggregation of interests in particular companies, have had, in numerous instances, the effect to create an additional and entirely new department of the service, devoted exclusively to the construction of new lines. In the past, railroads were, as a rule, built by companies organized expressly for that purpose, and having no connection whatever with existing lines. In many cases, the work was farmed out to construction companies. Many roads are being built in this manner to-day.

A large percentage of the mileage of railroads constructed each year, is for extensions and additions of ex-

isting lines and is built directly by the companies interested. When this is the case, the work is carried on with the same method and forethought that characterizes ordinary repairs and renewals. Each day, however, adds something to our knowledge of the possibilities and demands of such work. The construction of a railroad requires the most elaborate preparation in bringing together the needed material. The work must be anticipated throughout. It is necessary the person in charge should comprehend in advance every emergency. Preparation will occupy his thoughts for months in advance. An adequate depot of supply must be arranged in which to store the material needed in the progress of the work; he will need to ascertain how many ties will be required, and the various kinds; the number of tons of rails; the supply of track fastenings and road appurtenances; the bridge timber needed; the building material necessary; ballast, buildings for the force, the requirements of fuel-sheds, water-tanks, round-houses, machine-shops, store-houses, stations, platforms, sidings, yards, and other requirements of the service. He will also have to estimate the force required to superintend the work and carry it on; such work as is to be done by contractors, will have to be let. All these things and many others, must be looked after in advance, so that when the work is commenced, it may go on uninterruptedly to the end.

The celerity and smoothness with which work progresses under a competent superintendent, seems to detract from his value. He appears like a superfluity. The property will seem to grow of its own accord. If,

on the other hand, the superintendent is lacking in executive talent, his incompetency will make him so conspicuous that the ignorant observer will be likely to exclaim, "How indispensable such a man! How fortunate his company! Observe his untiring industry, his interest, his attention to details, his ubiquitousness." Experts, however, will have detected his weakness. They will have noticed that the men are crowded together so as to impede each other, or are so poorly supplied as to greatly delay the work; that his material is piled indiscriminately; that it is not located conveniently; that his estimates greatly exceed wants in some cases, and are grossly deficient in others; that the material is not on hand at the place where needed or at the time needed; that delays and embarrassments occur throughout, and that while everything seems to be bustling with preconceived direction and activity, the contrary is really the case.* All this, of course, influences cost, but the fact is never known for the reason that we rarely ever know with any degree of intelligence whether a road is constructed economically or not. We have a bird's eye view of the property, after it is finished, a kaleidoscopic statement of cost, the word of the official responsible, that is all. Everything is true and real—so far as it goes. But, unfortunately, it does not go far enough. It is not enough to enable us to judge whether the property has been constructed cheaply or not.

*I once heard a great manager say that he would rather see an officer with his feet on the window sill engaged in reading a newspaper, than see him bent over his desk performing merely clerical work; that in one case he had time and opportunity to think and to plan; while in the other he did not have the time and would soon lose the capacity.

At present the need of this information is not generally recognized. In many cases it is not necessary, it perhaps is not needed in any case. Each owner must decide for himself. I have heard a great capitalist, a man of wide experience and one of the most sagacious men I ever knew, say there was no necessity, in such cases, for keeping accounts; all he wanted to know was that the money went into the work. Our basis for judging of cost of construction work, of the equities of each case, is largely a matter of surmise, a belief in our fellow man, or disbelief in him. We agree in believing that a work has been honestly and skilfully performed, or the contrary. We look over the accounts, we analyze them, we listen to the story of the engineer, not forgetting even that he must be prejudiced; that it is impossible, however frank he may be, for him to avoid exaggerating difficulties. Still we know nothing, definitely. If the person in charge has been deficient in any respect, how impossible to discover it under our method of auditing. Indeed, such is the potency of words when addressed to those already prepossessed, or who have no means of measuring their value, that it is more than probable that his explanation, instead of condemning him, will have the effect to increase his sphere of usefulness. How is this to be avoided? By further classification of accounts? By additional statements from the engineer? No. But by re-surveying the property. It is not necessary that conclusions in regard to it should be a matter of surmise at all, a matter of speculation. But definite information may be obtained only by a re-survey. Such a work may

not bring any money back into the treasury of a company, but it will prove a source of future saving whenever existing methods may be improved upon, for the reason that the wisdom of two or more men is greater than that of one man, and may be depended upon to supply the defects of the latter. If a work has been wisely and economically performed, it will demonstrate the fact. The practice of re-surveying is not usual, I know. The custom is to estimate the cost of a road in advance, and no inspection is made afterwards to see whether the actual outlay is justified by the facts or not. I think the cost of a road after completion is as legitimate a subject of enquiry as the cost of a sidewalk or fence. Such an enquiry cannot by any possible means be distorted into a reflection upon the engineer in charge. On the contrary, it is a protection to him. If he has been reasonably efficient, the survey will demonstrate the fact. But if he has been cursed with mere fussiness when he should have been blessed with foresight, has technical experience without sense, has knowledge without discretion, has age without wisdom, energy without judgment, or if possessed with every desirable quality save honesty, a re-survey of his work by a competent and disinterested person will disclose the facts. Or, in the event the examination is not conclusive, it will afford a good basis, a shrewd hint, to judge by. The building of railroads should be subjected to the same principles of business that other manufacturers employ; only by such a course is it possible to detect defective methods. In their absence the owner is dependent wholly upon his

the highest order. I have had occasion to describe some of the characteristics of this official in a previous book. But imperfectly, and from one point of view only. I sketched roughly, and at best only his iron side. The side that the public see; his official countenance, behind which is hidden the responsibilities of his office. His personality, however, is directly the opposite of this. It is, compared with it, like the delicate tendril that clings to the rough oak, the moss that is nourished in the crevices of an iron cliff. Like every really strong man with proportionate physical and moral force, his sternness is largely conventional, sometimes wholly superficial, a cloak to his sensibilities. When appealed to by the distressed and the weak, his heart responds with the warmth and impulsiveness of a woman's. To the world his face is marble, his heart granite; face to face with man's weakness and necessity his countenance is flexible with kindly emotions, his heart stirred with generous thoughts. Such are the responsible managers of railroads separated from the cares and ambitions of place; men at once sympathetic, loyal and strong; the Cromwells of our time. The railway officer *per se* is something new, something little understood; he is the product of a new epoch; the creation of a new civilization. A man of affairs, of lofty aspirations, devoted to his employer and believing in the equities of his case. Versatile in his acquirements, free from prejudices, destitute of hobbies, wise, experienced, companionable, with charitable thoughts he stands ready to meet the world more than half-way in every generous and manly impulse.

In arranging a depot for construction supplies, the store-room and office should be located at the upper end of the yard, so that the work may be generally overlooked by the person in charge. As the store-house and office is at best only a temporary structure, it should be constructed with that view, and with the least possible damage to the material used in its erection. In arranging tracks for distributing material, the upper end of the first siding may be used for storing material for buildings; further on for rails; still further on for track fixtures, conveniently arranged and classified, with a view to being loaded on the cars with the rails. The second side track should be used for ties. This track, and those beyond it, if the amount of material to be handled is small, need only be connected with the main track at one end. In such cases, when the space between the first and second siding is filled with ties, the track may be crowded out and another rank laid, and so on until all are accommodated. Afterwards, as fast as a rank is loaded and shipped, the track may be crowded towards the centre again, and thus material may be reloaded directly on the cars without the necessity of being carried any distance. Each kind of tie should be kept separate. All switch material, including frogs, stands, rods, and head-blocks should so far as possible, be kept together for use, simultaneously. The rails, for convenience and economy, may be piled on racks made of ties. The foundation must, however, be solid and level. If the amount of bridge material is not large, it may be stored at the lower end of the first siding, where it can be put in shape for use before leav-

ing the yard. In storing material, different dimensions, sizes, and kinds should be carefully assorted and piled together. Thus, boards or rails of unequal length, or timbers of different dimensions, or ties intended for different purposes or locations, should not be piled indiscriminately, but so separated that each may be conveniently reached when needed. If the first siding, or indeed all the sidings, incline slightly in the direction cars are to go forward after being loaded, it will facilitate moving them without the aid of locomotives, thus cheapening the expense of handling. If the depot is located at a point where sidings are not sufficient for switching empty and loaded cars, it will be necessary to make special provision therefor. In such cases, a track may be laid parallel with the main track and between it and the first siding. In shipping such material as ties, rails, switches and track fixtures to the front, the exact quantity required may easily be determined by the store-keeper in advance. Material for bridges and buildings is, however, more varied and requires specific orders in each instance as regards kind and quantity, otherwise great waste will ensue. My attention has been called to a very effective means of handling this material. The engineer in charge furnishes the store-keeper with a list of the material required for particular kinds of structures. With this he deposits a sketch of each kind and class of structure, showing it when completed. When he requires material, he designates the diagram of the structure wanted. This plan enables the latter to fill the order without error or waste, and consequently at the minimum cost, to send

timber of the right length and dimensions, and in the right quantity, and boards of the kind and amount needed, and so on. Each structure is, in fact, shipped complete, the supplies tallying exactly with the wants of the builder.

All orders for material to be shipped from a yard should be addressed to the store-keeper. He should, moreover, be furnished with copies of requisitions when made and should know when supplies will be needed and the probable time of their receipt. He must also know whether they are to be unloaded in the yard or sent to the front as received. He should, in fact, with the engineer, understand all the details connected with the material to be used, so that he may anticipate its need and see that it is supplied in the manner most convenient for use. The necessity for forethought and energy on the part of a store-keeper is apparent. He must be unceasingly watchful to ensure the arrival of material in due season and prevent its being received or shipped without his knowledge or entry on the books. He must see that material is unloaded and loaded with a view to economy in handling cars; that in loading, due observance is given to the easy and rapid movement of material to the front. He must insist that orders upon him shall be given in advance, so that material may reach its destination at the right moment. Orders for material must state explicitly for what it is to be used. In unloading at the front, all empty packages should be reloaded and returned to the store-keeper for future use or disposition. Material must be inspected and the quality ascertained as in other cases,

except that even greater rigor must be observed if possible. Upon receipt of invoices, they must be compared with requisitions to see that orders have been properly filled. For this purpose, invoices should, if possible, be sent in advance of the goods. When material is sent to the front without being inspected, orders must be given to have the work performed subsequently, and it is the duty of the store-keeper to see that it is done by a competent and trustworthy person. In forwarding construction material from the supply depot to the front, the store-keeper should (to prevent confusion) give the order to the foreman of the yard; it should be explicit as to the thing required, name of consignee, place, purpose, etc. In the performance of his duties the foreman of the yard should carefully inspect all material and furnish the data required in way-billing. Each shipment must be regularly way-billed, and the name of the conductor inserted on the bill. Each bill should be receipted by the person to whom the goods are consigned and the purpose for which the material is to be used duly stated thereon by him. The bill (or a copy thereof) should then be sent to the store-keeper so as to afford him the data he needs to verify his accounts and assist him in determining the thing to be charged. The yard should be under the direction of a general foreman, and when the amount of material warrants it, the force should be divided into sections, each section having a foreman and being allotted a particular class of work. The wages of these foremen need be but little, if any, greater than laborers', as they should perform work in common with them. The author-

ity they possess, however, will serve to secure greater discipline and intelligence than would be otherwise attainable at an equal cost. Such disposition will also prevent jealousies and confusion. It will educate men in the handling of particular kinds of material and otherwise facilitate work and serve to fix responsibility.

The precautions usually taken against fire should be redoubled in the case of construction depots. A sufficient force should also be maintained at all times to guard the property.

Whenever a depot of supply is established for construction material, a store-keeper should be appointed to take charge of it. His duties should be confined to the work immediately on hand; he should be experienced and should give his immediate and undivided attention to his duties. The work of receiving, inspecting, caring for, and making returns for construction material, should be a thing in itself, at once independent and isolated. The keeping of the time and the making of construction pay rolls, including the giving of discharge certificates, forms a part of the duty of the construction force. This concentration of duties is necessary in order to secure immediate responsibility, thoroughness and promptness in the discharge of business. Any attempt to blend the construction forces of railways with their operating forces, cannot but redound to the disadvantage of both. The duties and responsibilities that attend construction work should be things apart, a department in themselves.

Construction store-keepers work under great disadvantages compared with those connected with the ope-

rating force, for the reason that their assistants are usually temporary and, therefore, in the majority of cases, unskilful; at the same time the work must be conducted with the utmost rapidity and method. In addition to the handling of supplies, the duty of keeping the time of men, making the pay-roll, distributing the same, issuing discharge certificates, and kindred duties, form a part of the duties of store-keepers as already described. A person of considerable experience as a store-keeper, and familiar with the methods of one of the most efficient railroad builders in the country, (Mr. P. E. Hall) writes as follows:—

“ The handling of large quantities of material makes it imperative that the supply yard should be arranged with a view to economy in receiving and forwarding, as well as for convenience in handling. Under ordinary circumstances, and where there is sufficient room to admit of its being done, the yard tracks should be so laid that the more bulky supplies can be piled on separate tracks having but one class of material to each track, and so grouped that the loading and making up of supply trains may be accomplished with convenience and dispatch.

“ As ties constitute the greater bulk of construction supplies, they should be so piled as to ensure the greatest economy of labor in unloading and reloading, and secure protection against fire at the same time. Convenient handling may be secured by putting the ties in long parallel ranks, leaving occasional intervals of about fifty feet; the ties to be laid adjacent to and at right angles with the track, and as soon as a rank is completed for the full distance required for the tie piles, the track should be thrown over sufficiently to admit of the

construction of another rank. Where this plan is adopted, however, the track can only be connected at one end, leaving the other free to be swung. By this system, ties, in either unloading or reloading again, need not be carried for a much greater distance than their length.

“Another plan which admits of the use of both sides of the tie track for storage, and which allows a track connection at both ends, thereby making this class of material more accessible, is to arrange the piles in groups extending back to one-half the distance to adjoining track and with fifty-foot openings longitudinally at intervals of about one hundred and fifty feet. Ties in these groups should be arranged with the rank next to the track built up to the height of the car floor. The other ranks should extend back to the required distance and at right angles to the first rank, but carried to a greater height.

“This plan, as compared with the former one, admits of a short parallel track being used, the advantage of which is that ties coming in box cars at the time track laying is in progress, can be transferred to flat cars (which, from their capacity for greater loads, should be used in construction) with less labor than would be necessary were they put off on the ground, thus saving their handling a second time.

“In addition to the force required to handle the material, the yard, if a large one, should have a good car-repairer, who should have charge of all supplies for the repairs of cars and the delivery and shipment of oil and waste for train and other service. He should make a daily report to the store-keeper of all material used by him. The supply yard should be in charge of a general foreman, who should have supervision and control over the switch engine, and should be accountable for the general efficiency of the force, including the filling of orders, the general arrangement of supplies, and

the proper inspection of piling ties, rails, bridge timber, etc. He should be assisted by a check clerk, whose duties should be to check all supplies as unloaded or forwarded, and enter in detail the contents of each car on the yard book, and make a daily report of the same to the store-keeper. It should be the duty of this clerk to keep the time of men in the manner and form prescribed."

Many, perhaps all of the foregoing details are understood by those versed in railway construction, but they are not understood by railway men generally, or by railway store-keepers. Indeed, construction work is so exceptional in its nature, that the force carrying it on is rarely the same for two seasons, so that the simplest details, while well known to veteran railroad builders, afford valuable hints to those whose opportunities have been more restricted.

In the building of railroads, all freight, whether construction supplies or otherwise, should be regularly way-billed, and all passengers should be regularly ticketed. This will prevent confusion and ensure the collection and return of the revenue that accrues from business done while the road is being built.

In closing a construction depot, the amount of material on hand, including the amount located along the line or elsewhere, should be carefully inventoried and invoiced to the local store-keeper, so that he may watch its disposition afterwards. It is unavoidable in keeping construction accounts that errors and omissions will occur. The result of this will be, in some cases, a surplus; in others, a deficit. Whatever the balance may

be (upon the closing of a supply depot), after including the value of the material on hand invoiced to the local store-keeper as described above, it should be credited, or charged, as the case requires, to the several construction accounts, in the proportion that the amount of material expended on such accounts bears to the total amount of material expended. When a depot of supplies is continued from season to season, an inventory should be taken with the close of business each year, or oftener, and the accounts adjusted to conform thereto.

CHAPTER XVI.

INVENTORY OF MATERIAL ON HAND.

An inventory is necessary on many accounts. It is necessary in order to correct the general books from time to time to harmonize with the facts, that is, to make the amount charged to material agree with the amount on hand. Another purpose is to familiarize store-keepers and others immediately concerned with the stock on hand. It serves to call particular attention to each article; to those that are necessary or valuable and those that are not; to the articles that are current and those that are obsolete. It is a review of operations and emphasizes the stable and the weak spots. Moreover, when taken it is an opportune time to re-adjust prices to correspond with current values. It serves also to indicate the care that has been exercised in handling mate-

rial and in keeping the accounts. If the amount varies greatly from the sum charged on the books, it indicates a lack of method somewhere, either in disbursing the material or in charging it incorrectly. Differences will, of course, creep into the accounts, but as they are as likely to be over as under, the books should practically balance at the end of the year. When they do not, it suggests to the store-keeper the necessity of carefully reviewing his methods of business.

How often an inventory should be taken, is a matter about which opinions will differ. The custom with merchants generally is to take it once a year, and, as their judgment in such matters is beyond criticism, their practices may be accepted as authoritative. In the case of railroads, the proper time to take an inventory is at the close of the last day of the fiscal year, unless this period occurs at a season when the ground is likely to be covered with snow and ice; in such case, some other time should be designated, as it is impossible to take a correct inventory under such circumstances.

The inventory should embrace all material at store-houses, shops, rolling-mills, and on the line of road and elsewhere, owned by the company, including general supplies, stationery, fuel, track material, and other stores. Afterwards, the general books of the company should be adjusted to conform thereto; if the value of the material on hand as shown by the inventory, is less than the amount charged on the general books, the various accounts upon which material has been disbursed since the last inventory, should be charged with the

difference pro rata; if the amount charged to material is less than the amount on hand as shown by the inventory, the various accounts should be credited pro rata and the ledger account increased accordingly.

While a general inventory of material may not be required to be taken oftener than once a year, special inventories or examinations of particular classes of material may be advantageously taken at more frequent intervals. This is so in regard to brasses, tools, and kindred articles in the hands of employes. I think inventories of this kind should be taken as often as once a month, and as much oftener as may be necessary to secure care and responsibility upon the part of those who have the material in charge. An inventory of rails and ties on hand may also be made to advantage as often as twice a year, and the books adjusted to conform therewith. It is also a question whether it would not be a good plan, in the event of any great or abnormal change in prices, to take an inventory so as to harmonize the books with existing conditions; but as a rule it is not probable that any injustice or injury will be done, even in such cases, by waiting until the customary time. In those cases where material is scattered promiscuously about a yard, the watchfulness necessary to protect it will amount to the same thing as taking an inventory every day; it is only by such unceasing care that the fluctuations in the supply can be accurately determined and the accounts made to harmonize therewith, while the facts in the case are still ascertainable.

Inventories of construction material in yards set apart for such purpose, should be taken at the close of the building season; in the absence of such a period, it should be taken upon the completion of each division of road, and at such intermediate time as may be thought best.

The difficulty attending the taking of an inventory will be great or small, according to the facilities for properly storing supplies. If these facilities are inadequate, rendering it necessary to widely scatter the material, or to pile different articles or classes together indiscriminately, the difficulties will be greatly magnified; if, however, the facilities permit careful storage and classification, the work will be much simplified.

An inventory, when taken, should be exhaustive, every device being used to make it thorough and correct. The work should begin with the close of business on the day assigned for taking the inventory. Much preparatory labor may, however, be done in advance of this, in arranging, classifying, weighing, and counting the stores; also by inserting the names and prices of the articles in the book used for taking the inventory. Indeed, the form of inventory itself may, if necessary, be made out in advance, leaving only the work of inserting quantities and values after the completion of the work; the omissions and errors that will unavoidably occur when this is done may be supplied and corrected on the face of the document afterwards without disfiguring it, or lessening its value. But whenever work is done on the inventory in advance of the day appointed, the utmost care must

be taken to avoid or correct the errors that such a practice naturally invites; in other words, care must be taken to see that, in the event any material inventoried in advance is used before the day for taking the inventory, the correction is duly made. The work of taking an inventory at a general store-house is described by one familiar with the task, as follows:—*

“Journals (similar to alphabetical indices) are ruled, marked, and labeled according to the work required, viz.: one for each store-room, one for outside material, for scrap-house, for lumber yard, for manufactured material, for miscellaneous supplies, and so on. These books are given to the foremen in charge of stores in the respective departments. It is not necessary to wait for the designated day to commence taking the inventory. As a general rule, we commence from two to three weeks ahead weighing, measuring, and counting such material as can thus be handled. In this way we distribute the work. A good portion of the iron on hand may in this way be easily weighed and marked in advance. On the day appointed for the inventory, the balance of material (*i. e.*, that not already ascertained) is added to the portion already summed up. Two or three days in advance the employes are detailed so that each foreman will have the use of as many office clerks as are necessary, and each clerk will have two or three laborers. The work is divided so that each man knows exactly the portion assigned him. On the appointed morning, each man is at his post, provided with blocks of paper, pencils, scales, etc. We commence at one end of the store-house and go directly through, making a record of everything in turn. As soon as an

*I desire in this connection to acknowledge the obligations I am under to various railway officials throughout the country, particularly those who have the handling of railway supplies, for valuable information and suggestions.

article has been recorded, it is marked with a cross, to indicate it has been inventoried. The foremen of the departments follow their men and gather up the records that have been completed; these are taken to the foreman's office and carefully examined; they are then posted in the journal referred to. Lumber, scrap, and outside material is inventoried in the same way. Manufactured material is the most difficult, as it is scattered all over the various shops. Hence, the greatest care must be taken to get at the facts. We keep a record of all material as it goes into the shops to be worked up, noting when the same is returned. We use this in taking the inventory to show what is in the shop. With this we figure prices, including labor, up to the time of taking the inventory. At the close of the day we have inventoried all material on hand. The weights and measures are afterwards figured and the articles recapitulated, prices placed opposite each item, and the total stated. The contents of the journals are then drawn off on the inventory blanks: the latter are footed, copied in tissue copy book, and sent forward."

Another store-keeper says:—

"I begin with some article in one corner of store-room, take screws for instance, beginning with the lowest number, and count the number of that size and so on to the largest size, entering the price of each different size as well as number, and so continue through all the material on hand, giving number, quality, or pounds, as the case may be."

When an inventory is to be taken by foremen not fitted to perform such work, either at isolated shops or upon the track or elsewhere, a competent person should be sent to assist in the work. As a rule, however, if a printed list of the articles to be inventoried is furnished

to track foremen and others, they will be able to set down opposite the various articles the quantities on hand, leaving the prices and total values to be inserted afterwards by the store-keeper.

In taking an inventory, the store-keeper should commence at an initial point and follow up the work in due order, taking all classes of material as they come. Only by such a course can omissions and confusion be prevented. The description of each article as entered on the return, should be so full as to fix its status correctly and fully, and permit the insertion of the price afterwards. Any exceptional circumstance in connection with an article or class of material, such as that it is unfit, in bad order, not needed, or that it has ceased to be usable, should be carefully noted on the return for the information of all concerned. The difficulty of determining the prices of articles will be greatly enhanced when the cost of transportation has to be added to the values as entered in the price list. If, however, intelligent care has been used in recording charges for transportation, it will not be difficult for the store-keeper to determine accurately the amount to be added to each article on account thereof. The necessity of adding these charges to the price must not be lost sight of in a single instance, as any omission to include them will magnify the difference between the total value of supplies on hand as shown by the inventory and the amount charged to material on the general books. In reference to transportation charges on supplies, I may say in parenthesis, that the practices of railroad companies vary. In some instances, railroads charge for transporting over

their own roads the supplies they use in operating. As a rule, however, this is not the general custom, the only charges recognized on material being those paid to other companies for transportation over such lines. It is not of great importance which rule is observed. It should, however be uniform, so that in judging of the relation that the operating expenses of a road bear to its earnings the basis may be understood. When local charges are added for transporting supplies, the effect, of course, is to increase the earnings by that amount, the charge, whatever it is, being added immediately to cost of material (an asset), afterwards it is transferred (when the material is used) to the expense account. The effect of the practice will not be uniform on different roads, its influence upon earnings being dependent upon the length of the haul, the rate charged, etc. While the practice of making a charge for transporting operating material is not generally recognized, it is eminently proper in the case of construction supplies. Practices differ here again; some companies charging tariff rates, while others charge only the estimated cost of transportation; some companies, moreover, charge on every species of construction material while others only on that which enters into new lines and extensions. Whatever the practice may be, a company is clearly justified, when it thinks proper to do so, in adding tariff rates to the cost of construction material, whether for new lines or for work on old lines, such as buildings, side-tracks, fences, and other construction work.

As already stated, the price at which articles should be inventoried, must be current prices. If the article is

one that has been embodied in a previous inventory, the value then charged must not govern, unless in harmony with existing facts. It is desirable that so far as possible, prices furnished to store-keepers by the purchasing agent or other official should cover every article. This will be possible in all cases, except in regard to the articles manufactured by a company; the present cost of manufacture of such articles (when known) should govern in fixing the price; when not known, the original cost should be used, unless known to be incorrect. Except in regard to articles of this description, no store-keeper should act independently in fixing the price of material; he should in every case refer to the prices fixed by the company, so that the inventory may as a whole be uniform, intelligent, and accurate.

If possible, skilled laborers should be selected to assist the clerks in taking the inventory. In the event the force employed by the store-keeper is not sufficient, he should make requisition upon the operating officer immediately in charge for such assistance as he needs. Men thus assigned should act continuously until the work is completed.

In taking an inventory, a book arranged in alphabetical order (similar to an index) provided with columns for articles, quantity, price, and value should be used. This will permit of easy reference afterwards and will serve to group the articles in the manner desired. Articles should be listed under general headings, such as "Iron," "Lumber," "Screws," "Cocks," "Nails," "Paints," "Oils," "Air-brakes," etc. The prices put upon articles

in the inventory should govern afterwards in disbursing such articles. In furnishing advices in regard to prices, the net price should always be given, *i. e.*, the price at which the material is to be charged when disbursed, plus any charge there may be for transportation. Great labor may be saved in taking an inventory, if care has been taken previously to note on large castings and similar material the weight or quantity thereof. This enables the store-keeper to ascertain the quantity at a glance. All material on hand at the time of taking the inventory that has not been charged to the store-keeper, should, of course, be omitted. One of the embarrassments attending the taking of an inventory is the difficulty of determining whether material just received or in transit, is charged within the time covered by the inventory, or subsequent thereto. To aid in making this distinction, a separate inventory of all such material should be taken pending definite information in regard to it. Afterwards, it should be embodied in the regular inventory or otherwise as circumstances require. Another embarrassment attending the taking of an inventory is the disbursement of material while the work is going on. To lessen this as much as possible, a mark should be put on each article or class of material when it is inventoried, as a guide to disbursing clerks and others. If this rule is observed, they will be able to determine at a glance whether to charge the material as having been disbursed prior or subsequent to the taking of the inventory. So far as possible all receipts, shipments and disbursements of material should be held in abeyance while taking an inventory.

In preparing for an inventory, the work should be subdivided in advance, and particularly assigned to those who are expected to perform the work, so as to prevent any omissions or duplications. The inventory when completed should be signed by the store-keeper immediately in charge, and should be sent forward at the time stated. The articles should be entered in alphabetical order on a blank designated for the purpose. Attached to, and accompanying the inventory, should be a complete summary thereof showing the aggregate amount of each class of material and the gross value thereof.*

A separate inventory should be made for old (unusable) material, including scrap. The total amount of this inventory should, however, be embraced in the general inventory, also in the summary thereof.

Separate inventories should be rendered for material, coal and wood. One inventory may embrace both coal and wood, the former being entered first, the other afterwards, a summary of the two being appended. Such further classification of the inventory may be made as the local wants of those in charge of material suggest. Thus, if separate operating accounts are kept for rails and ties, it would be well for the store-keeper in charge of track material to require a separate inventory for ties and rails, so that he may determine the amount of the excess or deficit (so far as his accounts are concerned) for those particular items separate from other track material. He

* I divide the material of a company in this manner under thirty-four heads for the purpose of better satisfying stock-holders and others interested as to the general authenticity of, and necessity for, the account. M. M. K.

should further advise the general accounting officer of the company of the result of his investigation in each case, so that the books may be adjusted on the basis of facts rather than on the basis of averages; in other words, if there is a surplus of miscellaneous track material and a deficit in rails and ties, the former may not be made to bear the burden of the latter.

An inventory should not include any property, material, or tools actually in use, which have been charged on the books as disbursed.

When, for any reason, it is impossible to ascertain the actual weight or quantity of any kind of material or scrap, a careful estimate of the same may be made, noting the fact, however, on the inventory.

Whenever a store-house or depot of supply is closed, an inventory should be taken of the material remaining on hand, which material should be invoiced to the store-keeper, whose duty it will be to look after its disposition.

FINIS.

Such are, briefly stated, the regulations that suggest themselves to me at this time as necessary to be observed in connection with the "HANDLING OF RAILWAY SUPPLIES." The subject is one of great importance to railroads. However skeptical the reader may have been in regard to this at the commencement, his disbelief, I apprehend, has vanished ere this. What I have had to say is necessarily incomplete, and at best a suggestion, in many cases, rather than a complete guide to those having such matters in charge.



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